



ANNUAL REPORT

**ONTARIO
WATER
RESOURCES
COMMISSION**

1965

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ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE CHAIRMAN

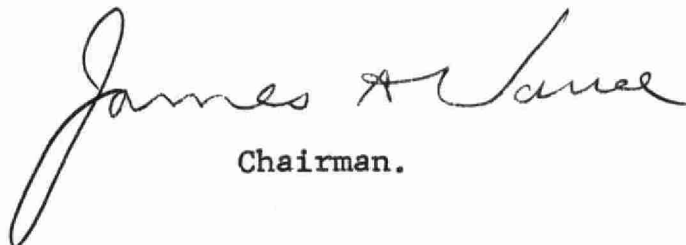
March 31st, 1966.

To the Honourable J. R. Simonett,
Minister of Energy and Resources Management.

Sir,-- I have the honor to submit for your approval
the Tenth Annual Report of the Ontario Water Resources
Commission, made in conformity with and under provisions
of The Ontario Water Resources Commission Act.

I have the honor to be, Sir,

Your obedient servant,

A handwritten signature in cursive script, reading "James A. Luce".
Chairman.



ONTARIO WATER RESOURCES COMMISSION
OFFICE OF THE GENERAL MANAGER

March 31st, 1966.

Dr. James A. Vance,
Chairman,
Ontario Water Resources Commission,
801 Bay Street,
Toronto 5, Ontario.

Dear Sir:

It is with pleasure that I present to you and the
other members of the Ontario Water Resources Commission
the Tenth Annual Report of the Commission.

Yours sincerely,

A handwritten signature in dark ink, appearing to read "D. L. Coverly", is written over the typed name "General Manager".

General Manager.

**TENTH
ANNUAL REPORT**

1965

**Ontario Water Resources Commission
801 Bay Street
Toronto**



ONTARIO WATER RESOURCES COMMISSION

Dr. J.A. VANCE
CHAIRMAN

J.H.H. ROOT, M.P.P.
VICE-CHAIRMAN

H. BROWN
COMMISSIONER

W.D. CONKLIN, Q.C.
COMMISSIONER

L.E. VENCHIARUTTI
COMMISSIONER

D.A. MOODIE
COMMISSIONER

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D.S. CAVERLY
GENERAL MANAGER

W.S. MacDONNELL
COMMISSION SECRETARY

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Introduction

by

D.S.Caverly

General Manager

While the provision of adequate water supplies for individuals, municipalities and industries, together with the protection of the water resources of the Province against pollution, remain the principal objectives of the Ontario Water Resources Commission, the year 1965 was highlighted by a number of important developments which greatly expanded its regular program. In particular, these developments had reference to the financing by the Province of water and sewage treatment works, the carrying out of pollution studies in the Great Lakes, and the undertaking of an inventory of Ontario's northern water resources.

It will be recalled that the Commission was authorized by the Government of Ontario in 1964 to undertake the construction of water pipelines with a view to supplying consumer municipalities with water at cost. In 1965, this authority was extended to include both water and sewage works. Under this arrangement the Commission may undertake the financing, construction and operation of such works, either for individual municipalities or on an area basis, with the facility remaining the property of the Province and a charge being levied on the municipality concerned, based on usage. The considerable number of applications received from municipalities by the end of the year for this type of financing suggests the stimulus which will now be given to the construction of provincially-financed water supply and sewage treatment works in the Province.

As a result of a Reference from the Governments of Canada and the United States to the International Joint Commission, the OWRC commenced working with that body during 1965 in a co-ordinated program of pollution investigation in the Great Lakes. Reference to this Great Lakes survey program is contained in the reports of the divisions of Sanitary Engineering and Laboratories. The purpose of this survey is to delineate conditions in the Great Lakes which border the Province of Ontario, to set forth known and possible causes of these conditions and to suggest remedial measures. An important aspect of this investigation is the use by the OWRC of aircraft in conjunction with the operation of surface water surveillance craft in the detection of pollution sources.

The Commission's involvement in the northern Ontario water resources inventory represents a considerable expansion of its water resources survey program. This study will be co-ordinated with that of provincial and federal government departments in a long-range program to increase the knowledge of the water resources of Ontario and of Canada as a whole.

The Commission is also participating in the International Hydrologic Decade Study which commenced during 1965. Through the Division of Water Resources a program has been undertaken to assess ground water resources and surface water runoff in certain areas of the Province.

The annual Industrial Waste Conference was again held in the month of June and was highly successful. This conference, the twelfth to date, was attended by approximately 250 people. Many excellent papers on the treatment and disposal of industrial wastes were presented and ample opportunity was provided for the free exchange of valuable information.

The regular programs of the Commission have experienced considerable expansion during the past year as well. Of particular importance has been the intensified approach which the Commission has made to the problem of industrial waste control. A new Division of Industrial Wastes was set up early in 1965, its responsibilities being of a two-fold nature - the field inspection of industrial waste disposal throughout the Province and the appraisal of all plans for industrial waste treatment and disposal facilities, under authority of the OWRC Act.

Over one thousand industries were under surveillance during the year. As indicated in the report of the Division of Industrial Wastes, communications containing a schedule of industrial waste control objectives were directed to a large number of industries throughout the Province early in the year and considerable progress has been made by the various industries in implementing waste control measures.

The program of construction of water and sewage works throughout Ontario continues. The report of the Division of Sanitary Engineering reveals that in 1965 the Commission issued Certificates of Approval for works valued in excess of \$140 million - an amount only exceeded in 1962 by a total of \$147 million. The Division of Construction entered into 42 contracts valued at more than \$24 million.

During 1965, a total of 25 new projects came into operation (nine waterworks and 16 sewage works) bringing the number of works operated by the Division of Plant Operations to 255.

A number of important research projects were carried out during the year associated with the problems of water supply and sewage treatment.

The facilities of the laboratory operated at full capacity, with a total of 67,405 samples being analyzed in 1965 as compared with 5915 in 1956.

Details of the varied programs of the Commission are contained in the reports of the divisions and branches. Collectively, they give some indication of the work that has been accomplished during the past year as well as an outline of some of the programs which will occupy the attention of the Commission in 1966.

STAFF ORGANIZATION

Staff Organization as of December 31, 1965:

General Manager	-	D.S. Caverly
Assistant General Managers	-	L.E. Owers
	-	K.H. Sharpe
	-	F.A. Voegel
	-	A.K. Watt
Commission Secretary	-	W.S. MacDonnell
Assistant to the General Manager	-	L.M. Tobias

ADMINISTRATIVE BRANCHES:

Information: Information Officer	-	J.C. Scott
Legal: Senior Solicitor	-	H. Landis
Personnel: Personnel Director	-	A.R.W. Uren

DIVISION OF CONSTRUCTION

Director	-	A.W. Shattuck
Assistant Director	-	J.C.F. Macdonald

DIVISION OF FINANCE

Comptroller and Director	-	D.A. Joynt
Assistant Comptroller	-	E.F. Heath

DIVISION OF INDUSTRIAL WASTES

Director	-	R.H. Millest
Assistant Director	-	D.P. Caplice

DIVISION OF LABORATORIES

Director	-	J.H. Neil
Assistant Director	-	J.G. Duncan

DIVISION OF PLANT OPERATIONS

Director	-	B.C. Palmer
Assistant Director	-	C.W. Perry

DIVISION OF PROJECT DEVELOPMENT

Director	-	P.G. Cockburn
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DIVISION OF RESEARCH

Director	-	A.J. Harris
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DIVISION OF SANITARY ENGINEERING

Director	-	J.R. Barr
Assistant Director	-	G.R. Trewin

DIVISION OF WATER RESOURCES

Director	-	K.E. Symons
Assistant Director	-	D.N. Jeffs

Administrative Branches

INFORMATION BRANCH -- John C. Scott, Information Officer.

The dissemination of information concerning the Commission and its programs continued to be the chief function of the Information Branch. This was accomplished in a number of ways. One was a printed information service distributed to all news media in Ontario as well as to officials of organizations and other interested individuals. Other activities involved the distribution of OWRC literature, much of which was planned, written and produced by branch personnel, and the handling of enquiries about OWRC activities, and requests for general information concerning water resources and water pollution. In addition, members of the Ontario Legislature were kept informed of OWRC water supply and water pollution control project activities in their own constituencies.

The news release service, known as the "Information Service", recorded its most active year since its inception in 1957. Highlighted were items concerning the Commission's expanded role in the related fields of municipal water supply and pollution control, and in the international Great Lakes survey program. Other releases featured the announcement that the Commission would be responsible for Ontario's contribution to a joint federal-provincial inventory of northern Ontario's water resources, and the OWRC's communication to the pulp and paper and other industrial groups concerning Commission requirements in the matter of their program for water pollution control.

The information service also provided progress reports on the construction of the Lake Huron Water Supply System, and summarized close to 50 reports on OWRC surveys. News releases were issued with reference to the Commission's research projects as well as a warning concerning the use of pesticides. Other OWRC activities, including staff appointments, and construction contract awards, were reported and information was issued on meetings called by the OWRC with reference to regional water supply and pollution control.

The exhibits program was expanded during the year, with displays being produced for the OWRC's first appearances at the annual exhibitions at the Lakehead, Ottawa, London, the International Plowing Match and Toronto's Royal Winter Fair. A new display was produced for the Canadian National Exhibition in Toronto, featuring technicians at work in a full-scale laboratory. At the year-end, preparations were being made for a Commission exhibit at Toronto's Canadian National Sportsmen's Show early in 1966, the OWRC's first appearance in this show since 1957.

A special tent show was arranged for several days at the time of the official opening of the OWRC's sewage treatment plant in the City of Chatham. Smaller displays were used at other official openings of OWRC projects at Harriston, Elmira, Midland and Timmins. At most openings, programs were arranged for secondary school students, consisting of special film showings and lectures, followed by attendance of the students at the opening ceremonies and tours of the works concerned.

In all exhibits, with the exception of the C.N.E., design and construction were carried out by branch personnel assisted by the Commission's Mechanical Services Branch. Some of the material was sent out on loan from time to time to interested organizations wishing to place exhibits in small fairs.

Two Commission publications, issued during the year, proved most popular. The demand for one, "The Story of Water", was such that reprinting was necessary in mid-year. The other was "The Ontario Water Resources Commission" which tells the story of the Commission's responsibilities and programs. A special pamphlet--"Water, Our Faithful Servant"-- was prepared for mass distribution at the various exhibitions.

A special colorful "water resources" poster was designed and was given wide distribution. This poster outlines water's many uses and points to the role of the OWRC in its conservation.

Special photographic assignments were undertaken, including the beginning of motion picture and still records of progress of construction of the Lake Huron Water Supply System. A start also was made on picture coverage of OWRC work on the Great Lakes.

Various events in which the Commission participated, such as official openings, exhibitions, conferences, meetings and courses for water and sewage plant operators, also were

included in the Branch's photographic program.

Special coverage, both news and photographic, was arranged for the 1965 presentation of the Commission's Distinguished Service Award to four recipients. Branch staff prepared material for speeches and special articles during the year.

The Branch carried out the Commission's display advertising program throughout the year. This included institutional advertisements in trade newspapers and special advertisements in daily and weekly newspapers in conjunction with official openings of OWRC water and sewage works projects.

The Branch placed 71 advertisements involving calls for tenders and equipment quotations for Commission construction projects, and was represented at all tender openings.

LEGAL BRANCH --- H. Landis, Senior Solicitor.

During the year the Solicitors' office provided a general advisory service to the Commission and to its personnel, supervised legal actions conducted on behalf of the Commission and prepared agreements and other legal documents.

There were several amendments to The OWRC Act in 1965. These had reference to:

- the quorum of members required to be present at Commission meetings;
- permits for the taking of surface water into storage for the watering of live stock or poultry;
- the implementation of OWRC reports made to a municipality;
- the statutory limit on reserve accounts for projects;
- the annual interest payable by a municipality to the Commission in respect of agreements for projects entered into after December 31, 1965;
- the number of members of the investment committee that invests monies in the Commission's Reserve Account and Debt Retirement Account;
- the Commission's control of industrial waste;
- the charging of fees for permits, approvals and copies of documents;
- the giving of false information in any application, return or statement made to the Commission;

During the year there were two corporations and five individuals convicted for contravention of the Act or regulations thereunder.

PERSONNEL BRANCH -- A. R. W. Uren, Director.

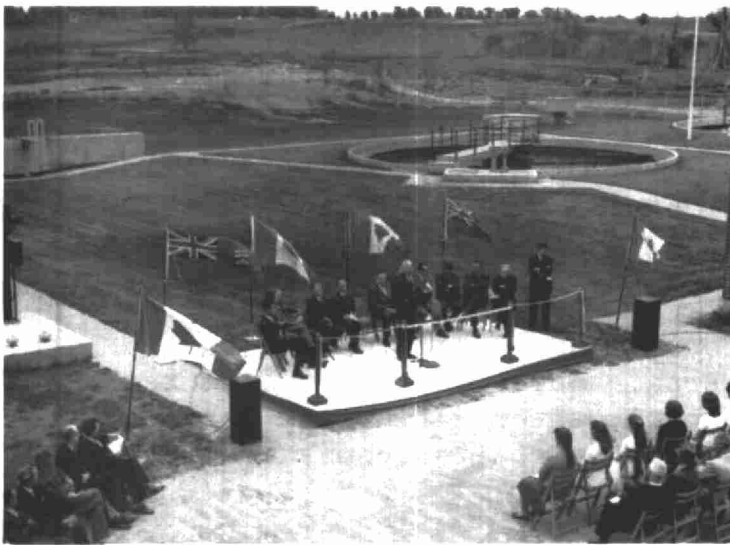
Since the activities of the Commission depend to a large degree upon engineering, scientific and technical skills, close attention was focussed on these disciplines in the Personnel Branch's recruitment program. Interviews were held at eight Ontario universities for the purpose of recruiting professional and technical staff required for the new fiscal year. Competition for the services of these new university graduates was keen; however, a high percentage of the engineering recruitment objective was achieved early in the year.

The summer engineering, scientific and technical programs of the various divisions were furthered by the employment of 59 university students.

During the Commission's annual Chief Operators' Conference the Personnel Branch participated in an afternoon discussion session, dealing with such matters as personnel policy, conditions of employment, health insurance and workmen's compensation.

At December 31, 1965, head office complement was 447, with the plant operations project staff totalling 219. On the same date, the Commission recorded the first retirement on pension of a member of the project staff.

The Province of Ontario Employees' Group Insurance Plan was introduced and explained to head office and project staff. Keen interest was shown and the transition from the old plan to the new was accomplished on schedule.



The OWRC exhibit circuit was province-wide for the first time. Above is a typical exhibit. An official opening is climaxed at left, and the photo below shows spectators "supervising" a water test at an OWRC display.



Division of Construction

A. W. Shattuck, Director
J. C. F. Macdonald, Assistant Director

During 1965 the Commission entered into 42 contracts value at \$24,332,531.84, of which \$15,910,291.23 was for water works and \$8,422,240.61 was for sewage works.

During the year 32 contracts were completed. These had a total value of \$6,854,679.00 and consisted of 22 sewage works totalling \$5,131,312.00 and 10 water works at \$1,723,367.00

The costs given above and under the project headings below are exclusive of Central Mortgage & Housing Corporation and winter works subsidies.

Summary of Projects

Black River (64-S-168)

Description of Project: Sanitary sewers.

Consulting Engineers: Sutcliffe Company, New Liskeard.

Tenders were received and opened December 9, 1964. The lowest bid, submitted by Vallee Construction Co. Ltd. in the amount of \$84,550.00, was rejected by the Commission as being too high and tenders will be re-called in early spring, 1966.

Brampton (64-W-136)

Description of Project: Construction of water mains and a deep well pumping station with a 1000 g.p.m. pumping capacity.

Consulting Engineers: W. O. Chisholm and Associates, Scarborough.

Completed: June 30.

Estimated Project Cost: \$387,250.00

Work on the water mains and the well began in March and was completed in late June.

Brampton/Chinguacousy (65-S-184)

Description of Project: 3.0 M.G.D. extension to sewage treatment plant.

Consulting Engineers: Proctor & Redfern, Toronto.

Expected Completion Date: October 1966.

Estimated Project Cost: \$1,512,750.00.

The contract was awarded for the extension to the plant comprising additional influent works, primary and secondary clarifiers and aeration tanks, as well as additional digesters and a new filter and chlorine building. Increased pumping and blower facilities are to be added. Construction is presently on schedule with approximately \$200,000.00 worth of work completed.

Brighton (63-S-149)

Description of Project: 12,200 lin. ft. of sanitary sewers, a trunk sewer and a lagoon.

Consulting Engineers: J. D. Lee & Co. Ltd., Kingston.

Completed: July 30.

Estimated Project Cost: \$187,355.00.

Work on this project commenced on January 8, 1965, and was completed and in operation five months ahead of schedule.

Chalk River (63-W-113)

Description of Project: 17,900 lin. ft. of water mains, 33 hydrants, service connections, addition to pump house including equipment and controls.

Consulting Engineers: M. H. Dineen & Associates Ltd., Ottawa.

Completed: May 1.

Estimated Project Cost: \$157,805.00.

Work on this project commenced in September, 1964, and continued during the winter months until completion.

Chatham (62-S-102 & 65-S-186)

Description of Project:

- Contract 1 - Sewage treatment plant.
Final contract cost -
\$1,479,430.00.
- Contract 2 - North Side interceptor
sewers, force main and
one pumping station.
Final contract cost -
\$197,682.00.
- Contract 3 - North Side interceptor
sewers, force mains and
two pumping stations.
Final contract cost -
\$360,420.00.
- Contract 4 - South Side interceptor
sewers, force mains and
two pumping stations.
Final contract cost -
\$554,078.56.
- Contract 5 - King Street interceptor
sewer.
Final contract cost -
\$344,410.00.
- Contract 6 - Outlet sewer from
Merritt Ave. to sewage
treatment plant.
Final contract cost -
\$199,065.14.
- Contract 7 - Trunk sanitary sewers -
Richmond St.
Est. contract cost -
\$558,160.00.
- Contract 8 - Trunk sanitary sewers -
Park Ave.
Est. contract cost -
\$483,200.00.
- Contract 9 - Merritt Ave. pumping
station.
Est. contract cost -
\$223,284.00.

Contract 10 - Park Ave. pumping
station.
Est.contract cost -
\$92,000.00.

Contract 11 - Cannery waste
treatment.
Est.contract cost -
\$450,000.00.

Consulting Engineers:

Todgham & Case Ltd., Chatham.
Gore & Storrie Ltd., Toronto.

Completed:

Contract 1 - May 10, 1965.

Contract 2 - June 12, 1964.

Contract 3 - June 18, 1964.

Contract 4 - September 10, 1964.

Contract 5 - December 15, 1965.

Contract 6 - May 18, 1965.

Expected Completion Date: Contract 7 - October 1966.

Contract 8 - October 1966.

Contract 9 - March 1966.

Contract 10 - May 1966.

Estimated Project Cost: \$5,100,000.00.

Contract 7 - This contract was approximately 5% completed by the end of the year and no delay in completion is anticipated.

Contract 8 - This contract was approximately 5% completed by the end of the year and was progressing quite satisfactorily.

Contract 9 - This contract was 90% completed by the end of the year and should be put into operation in January, 1966, with final completion in March, 1966.

Contract 10 - This contract was approximately 10% completed by the end of the year.

Contract 11 - Tenders have yet to be called.

Twp. of Clarke (Orono) (64-W-130)

Description of Project:	Contract 1 - Development of well (see report of Division of Water Resources). Final contract cost - \$9,674.00.
	Contract 2 - Well pumphouse, standpipe foundation, water mains, hydrants and service connections. Final contract cost - \$164,894.92.
	Contract 3 - 150,000 gallon steel standpipe. Final contract cost - \$21,474.00.
Consulting Engineers:	Marshall, Macklin & Monaghan Ltd., Don Mills.
Completed:	September 30.
Estimated Project Cost:	\$219,500.00.

Cornwall (64-S-172)

Description of Project:	Contract 1 - Brookdale Avenue diversion sewer. Est. contract cost - \$609,187.00.
	Contract 2A- Leitch-McLennan storm drainage system. Final contract cost - \$492,500.27.
	Contract 2B- Leitch-McLennan storm drainage system. Final contract cost - \$349,529.73.
	Contract 3 - Leitch Creek drainage system combined relief sewer. Est. contract cost - \$647,566.00.
	Contract 4 - Cumberland St. combined relief sewer. Est. contract cost - \$278,160.00.

Consulting Engineers: Gore & Storrie Ltd., Toronto.

Completed: Contract 2A - November 12.

Contract 2B - November 12.

Expected Completion Date: Contract 1 - May 1966.

Contract 3 - July 1966.

Contract 4 - January 1966.

Estimated Project Cost: \$2,563,772.00.

Contract 1 - The portion of the sewer tunnel under the Cornwall canal had to be delayed pending dewatering of the canal in December. Work was resumed in December and is expected to be completed under the canal by April. The balance of the sewer was completed within the original time for completion.

Contract 3 - This contract was awarded in December.

Contract 4 - This contract was substantially complete in November but some difficulties were encountered in cleaning this sewer due to the fact that the sewer had to be placed in operation as the work progressed.

Durham (63-S-148 & 65-S-196)

Description of Project: Sanitary sewers and extension, pumping station, force main and aerated sewage lagoon.

Consulting Engineers: M. M. Dillon Limited, London.

Expected Completion Date: May 1966.

Estimated Project Cost: \$474,951.00.

The work was about 75% completed at the end of the year and work is to continue throughout the winter.

Elmvale (62-S-118)

Description of Project: Contract 1 - Force main and sewage lagoon.
Final contract cost - \$53,899.04.

Contract 2 - Sewers and pumping station.
Paid to Contractor - \$56,262.01.

Contract 3 - Part A. Sewer and force main on Amelia St. and secondary pumping station. Part B. Repairs and completion of Contract 2 on a "cost-plus" basis. Final contract cost - \$172,594.38.

Consulting Engineers: Proctor & Redfern, Toronto.

Completed: Contract 1 - August 1963.

Contract 2 - Incomplete.

Contract 3 - September 1965.

Estimated Project Cost: \$300,000.00.

Englehart (63-S-152)

Description of Project: Pumping station, sewers, force main and lagoons.

Consulting Engineers: Sutcliffe Company, New Liskeard.

Expected Completion Date: June 1966.

Estimated Project Cost: \$110,169.00.

The uncompleted work mainly consists of access road and lagoon dykes on which further work was stopped due to wet weather conditions. The project was approximately 50% completed.

Twp. of Fauquier (61-S-79 & 61-W-78)

Description of Project: Sewers, water mains, water supply and sewage lagoon.

Consulting Engineers: Sutcliffe Company, New Liskeard.

Completed: August 24.

Estimated Project Cost: \$264,000.00.

Fort William (64-S-175)

Description of Project: Installation of 3,900 lin. ft. of 54" dia. concrete trunk sewer in tunnel.

Consulting Engineers: W. L. Wardrop & Assoc. Ltd., Winnipeg.

Expected Completion Date: September 1966.

Estimated Project Cost: \$956,896.00.

Work commenced on February 11, 1965. Progress has been slow due to the shortage of suitable labour and difficulties encountered in connection with pipe joints.

Fort William (64-S-173)

Description of Project: Renovations to existing sewage pumping station located on Brunswick Street.

Consulting Engineers: W. L. Wardrop & Assoc. Ltd., Winnipeg.

Completed: September 1965.

Estimated Project Cost: \$33,209.00.

Harriston (65-S-185)

Description of Project: Sanitary sewers (extension to sanitary sewer system constructed in 1964).

Consulting Engineers: B. M. Ross and Associates Limited, Goderich.

Expected Completion Date: January 1966.

Estimated Project Cost: \$96,342.00.

Work commenced in September and about 75% of the project had been completed by the end of the year.

Lake Huron Water Supply System (OWRC-WP-64-1)

Description of Project:

- Contract 1 - 72" dia. lake intake and 42" dia. plant drain.
Est. contract cost -
\$2,232,515.00.
- Contract 2 - Construction of low lift pumping station at Grand Bend.
Est. contract cost -
\$1,889,798.00.
- Contract 3 - Water treatment plant and high lift pumping station.
Est. contract cost -
\$5,485,589.00.
- Contract 4 - Supply and delivery of water pipes, specials and accessories.
Est. contract cost -
\$4,445,632.00.
- Contract 5 - Laying and jointing water pipes, special and accessories for 48" dia. pipeline.
Est. contract cost -
\$1,828,246.00.
- Contract 6 - Construction of terminal reservoir of 12 M.G.D. capacity.
Est. contract cost -
\$1,131,985.00.
- Contract 7 - Radio communication system.
Est. contract cost -
\$64,234.00.
- Contract 8 - Landscaping at Grand Bend.
Tenders to be called.
Est. contract cost -
\$47,000.00.
- Contract 9 - Drain at reservoir.
Tenders to be called.
Est. contract cost -
\$90,000.00.

Consulting Engineers: James F. MacLaren Ltd., Toronto.

Expected Completion Date: Contract 1 - October 1966.
Contract 2 - January 1967.
Contract 3 - January 1967.
Contract 4 - August 1966.
Contract 5 - October 1966.
Contract 6 - August 1966.
Contract 7 - December 1966.
Contract 8 - June 1967.
Contract 9 - August 1966.

Estimated cost of construction and engineering: \$18,500.00.

Work on the intake and treatment plant drain started up in September, 1964. Up to the end of November, 1965, when work was suspended for this year on the intake line, a total of approximately 4,300 ft. was laid. Approximately 4,000 ft. remain to be installed. Steel sheet piling for the low lift station has been driven. Approximately 90% of the floor slab of the treatment plant has been poured and good progress has been made in the walk of the flocculation tanks. The concrete base of the high lift pumping station was 75% completed.

The pipeline laying operation, which started in August, 1965, was suspended early in December; a total of approximately 32,000 ft. having been laid. At the end of December approximately 41,000 ft. of pipe for the pipeline had been delivered on site.

Work was proceeding fairly close to schedule on the terminal reservoir. The concrete floor slab had been poured and the walls nearly completed. A section of the roof slab had also been poured.

Listowel (64-S-174)

Description of Project: Sanitary sewers (extensions to the town system by town forces).

Expected Completion Date: July 1966.

Estimated Project Cost: \$40,204.00.

The work was carried out by the town's forces in conjunction with the rebuilding of streets and was about 60% completed by the end of the year.

Lucan (63-S-164 & 65-S-194)

Description of Project: Trunk sewers, service connections, prefabricated pumping station, force main and lagoon.

Consulting Engineers: M. M. Dillon Ltd., London.

Expected Completion Date: January 1966.

Estimated Project Cost: \$199,240.00.

Work started in February, 1965, but little progress was made until May due to bad weather. During the summer months all trunk sewers on Project No. 63-S-164 were completed and by October the pumping station and lagoon were operative.

Work on the extension under Project No. 65-S-194 started early in November and by the end of December all trunk sewers were completed with the exception of an extension off Alice St., which is to be completed in January 1966.

Maidstone (64-W-131)

Description of Project: Extensions to existing water distribution system including 9,000 lin. ft. of 8" dia. mains and 5,000 lin. ft. of 6" dia. mains.

Consulting Engineers: C. G. Russell Armstrong, Windsor.

Completed: December 14.

Estimated Project Cost: \$84,422.00.

Marmora (64-W-134)

Description of Project: 5,200 lin. ft. of 6" dia. water mains including hydrants and service connections.

Consulting Engineers: R. V. Anderson Associates Ltd., Toronto.

Completed: August 30.

Estimated Project Cost: \$71,290.00.

Work on this project commenced on March 30, 1965, and was completed on schedule. The project cost increased due to rock excavation exceeding the quantity anticipated.

Metro. Toronto/Toronto Twp. (63-S-160)

Description of Project: Extension to sewage treatment plant.

Consulting Engineers: Gore & Storrie Ltd., Toronto.

Estimated Project Cost: \$2,043,659.00.

Tenders were opened on December 9th and the recommendation for the award of contract was made on December 13th but a contract had not been executed by the end of the year.

Midland (63-S-146 & 63-S-151)

Description of Project: Contract A - Storm and sanitary collectors, force main and outfalls. Final contract cost-\$407,377.00.

Contract B - Sewage treatment plant and two pumping stations. Final contract cost-\$493,296.00.

Consulting Engineers: Canadian-British Engineering Consultants, Toronto.

Completed: Contract A - November 1, 1964.

Contract B - April 20, 1965.

Estimated Project Cost: \$1,016,400.00.

Milverton (64-S-166)

Description of Project: Sanitary sewers, sewage pumping station, force main and sewage lagoons.

Consulting Engineers: R. V. Anderson Associates Ltd., Toronto.

Expected Completion Date: December 1, 1966.

Estimated Project Cost: \$371,741.00.

Work on this project commenced on December 1, 1965. By the end of the year, the contractor had completed the concrete work for the pumping station.

Township of Moore (Corunna) (64-S-169)

Description of Project Factory-built sewage pumping station,
force main and extension of sanitary
sewers.

Consulting Engineers: James D. Nisbet, Sarnia.

Completed: September 15.

Estimated Project Cost: \$67,773.00.

Township of Mountjoy (65-S-195)

Description of Project: Sanitary sewers, service connections,
force main and sewage pumping station.

Consulting Engineers: Gore & Storrie Ltd., Toronto.

Engineering drawings will be completed and tenders called in
February, 1966.

Parry Sound (62-S-113)

Description of Project: Contract A - Sanitary trunk sewer,
force mains and river
crossings.
Final contract cost -
\$370,739.00.

Contract B - Seven sewage lift stations.
Est. contract cost -
\$107,000.00.

Contract C - Primary sewage treatment
plant.
Est. contract cost -
\$278,500.00.

Consulting Engineers: Proctor & Redfern, Toronto.

Completed: Contract A - December 22, 1964.
Contract B - July 19, 1965.
Contract C - July 19, 1965.

Estimated Project Cost: \$886,600.00.

Port Colborne (62-S-100)

Description of Project: Contract A - Sanitary and storm
sewers.
Est.contract cost -
\$843,505.00.

Contract B - Sanitary sewers,
storm sewers and
force main.
Est.contract cost -
\$112,703.00.

Contract C - Sanitary sewers,
8 and 10 inch
diameter.
Est.contract cost -
\$165,607.00.

Contract D - Two pumping stations,
discharging 3600 and
120 G.P.M.
Est.contract cost -
\$110,985.00.

Consulting Engineers: Canadian-British Engineering
Consultants, Toronto.

Completed: Contract A - December 31.
Contract B - October 1.
Contract C - December 1.
Contract D - October 1.

Estimated Project Cost: \$1,300,000.00.

Work commenced in January and by mid-December all main
sewers, services and pumping stations were completed. Restoration
of roads, sidewalks and private properties remain to be done in
the spring of 1966.

Rockland (63-S-153)

Description of Project: Sanitary sewers, two pumping
stations, force main and a
one-cell lagoon.

Consulting Engineers: J. L. Richards & Associates Ltd.,
Ottawa.

Completed: October 4.

Estimated Project Cost: \$296,950.00.

Work on this project commenced on July 16, 1964. The completion was delayed due to unexpected soil and weather conditions. The system has been in operation since October, 1965.

Township of Saltfleet (65-S-191)

Description of Project: Extensions to sewer system.

Consulting Engineers: Township Engineer,
Township of Saltfleet.

Expected Completion Date: January 1966.

Estimated Project Cost: \$36,000.00.

Work commenced on November 1st and it is expected that all sewers and services will be completed by mid-January, 1966. The restoration of roads and other properties will be completed in the spring.

Sault Ste. Marie (Stage 2) (64-W-138)

Description of Project: 24" dia. water main to extend distribution system to the north.

Consulting Engineers: Proctor & Redfern, Toronto.

Completed: September 30.

Estimated Project Cost: \$415,000.00.

Southampton (63-W-124)

Description of Project:

- Contract A - Trunk water main.
Est. contract cost - \$91,500.00.
- Contract B - Water intake and sub-structure of filtration building.
Est. contract cost - \$129,500.00.
- Contract C - Pumping station and filtration plant.
Est. contract cost - \$158,500.00.

Consulting Engineers: Philips & Roberts Ltd., Burlington.
Completed: Contract A - October 1965.
Contract B - December 1965.
Expected Completion Date: Contract C - January 1966.
Estimated Project Cost: \$420,000.00.

All of the work was completed except for the installation of the standby power unit, which still had not been delivered, and the installation of a small amount of piping.

Sutton (64-S-171)

Description of Project: Sanitary sewers (extension to those installed in 1963).
Consulting Engineers: Kilborn Engineering Ltd., Toronto.
Completed: April 29.
Estimated Project Cost: \$42,500.00.

Waterdown (63-S-163)

Description of Project: Section I - Sewer system.
Est. contract cost -
\$232,900.00.
Section II - Sewage treatment plant.
Est. contract cost -
\$183,500.00.
Consulting Engineers: Kilborn Engineering Ltd., Toronto.
Completed: Section I - November 20.
Section II - December 31.
Estimated Project Cost: \$471,500.00.

Work was commenced in March on the sewage treatment plant and was completed in late December. The system of sewers was begun in April and completed in late November.

Township of Widdifield (64-W-133)

Description of Project: Trunk water main extension.
Consulting Engineers: Northland Engineering, North Bay.
Completed: August 14.
Estimated Project Cost: \$37,100.00.

General

One of the main problems encountered throughout 1965 was the substantial increase in the tendered prices obtained by comparison with prices tendered during the preceding years. This rise in prices was coupled in many instances, particularly in the more remote areas of the Province, with very few tenders being received. This situation is being encountered throughout the construction industry and is making it difficult to proceed with construction in municipalities where financial resources are limited.

It is expected that the proposal to construct sewage works and water works owned by the Government of Ontario will result in a considerable increase in the Commission's construction activity during 1966 and will benefit in particular the smaller municipalities which would probably be unable to finance projects in the usual way.

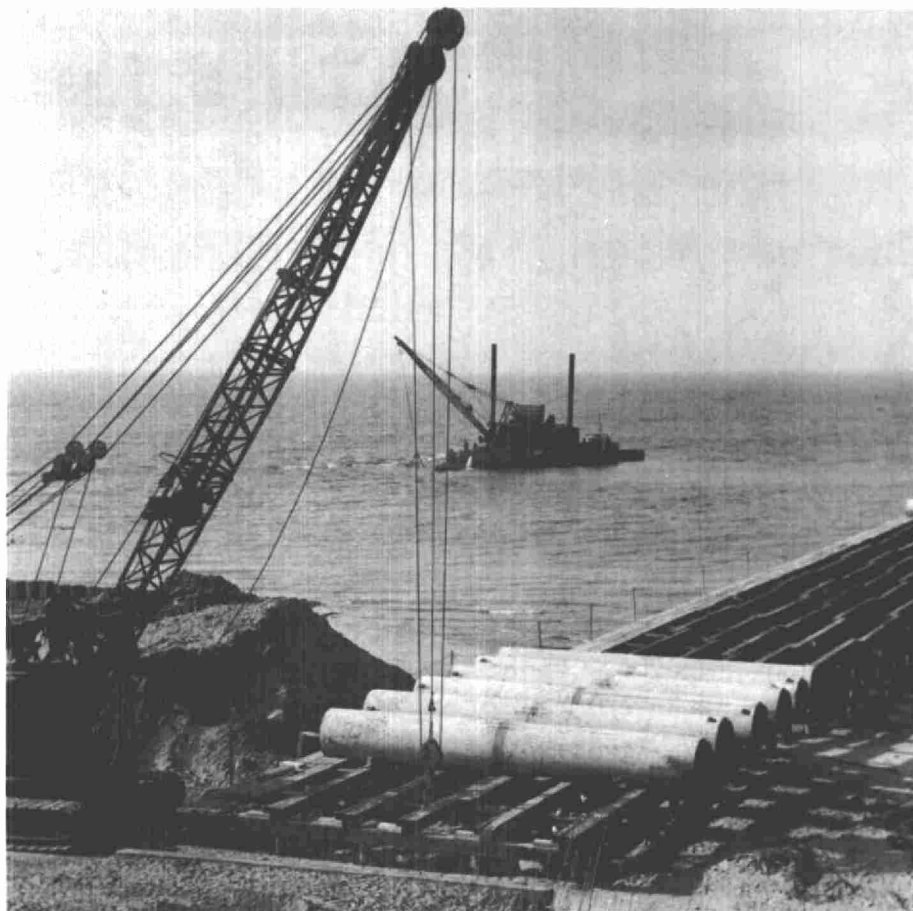


Construction of the 12-million-gallon Arva reservoir, which is part of the Lake Huron Water Supply System.



Lake Huron Water Supply System treatment plant under construction at Grand Bend.

Pipe loading wharf at the intake site of the Lake Huron Water Supply System, Grand Bend. A pipe-laying barge is in the background.



Division personnel examine plans of a project.

Division of Finance

D. A. Joynt, Director and Comptroller
E. F. Heath, Assistant Comptroller

The continued growth of Commission activity and expansion into new fields had a direct bearing on the activity of the Division. The expansion of activity included The Great Lakes Water Quality Survey, The Northern Ontario Water Resources Survey, the engineering studies required regarding provincial projects and the construction of provincial projects.

The enlarged program of the Commission is revealed in the following statistics.

(A) Ordinary Vote Expenditures

1962/63	\$ 2,270,256
1963/64	\$ 2,685,955
1964/65	\$ 3,114,742
1965/66	\$ 4,159,000 (Est.)

(B) Gross Capital Expenditures

1962/63	\$24,772,603
1963/64	\$21,233,906
1964/65	\$15,623,685
1965/66	\$16,500,000 (Est.)

(C) Gross Capital Receipts

	Winter Works Subsidies	Payments from Municipalities, C.M.H.C. and Others	Total
1962/63	\$1,550,892	\$10,811,383	\$12,362,275
1963/64	\$1,891,147	\$12,060,099	\$13,951,246
1964/65	\$1,452,838	\$ 6,771,250	\$ 8,224,088
1965/66	\$ 375,000 (Est.)	\$ 6,500,000 (Est.)	\$ 6,875,000 (Est.)

(D) Expenditures in the Operation of Water and Sewage Treatment Plants

1962	\$1,375,787
1963	\$1,829,892
1964	\$2,548,350
1965	\$2,706,344

(E) Receipts from Billings to Municipalities

	<u>Debt Retirement</u>	<u>Reserve for Contingencies</u>	<u>Interest</u>	<u>Project Operation</u>	<u>Total</u>
1962	\$ 960,797	\$345,137	\$2,439,253	\$1,639,612	\$5,384,799
1963	\$1,104,654	\$466,425	\$3,026,561	\$1,998,665	\$6,596,305
1964	\$1,436,669	\$569,489	\$3,732,195	\$2,622,652	\$8,361,005
1965	\$1,605,775	\$644,651	\$3,914,297	\$2,858,197	\$9,022,920

At December 31st, loans from the Province of Ontario for the purpose of constructing water and sewage projects totalled \$80,135,786; (\$75,597,460 for municipal projects and \$4,538,326 for provincial projects). The effective rate of interest payable to the Province on the total amount is 5.661 per cent or some \$4,536,802 per annum.

During the year, invoices were sent out to municipalities with OWRC projects, in the total amount of \$9,022,920 as follows:

Debt Retirement	\$1,605,775
Reserve for Contingencies	\$ 644,651
Interest	\$3,914,297
Operations	\$2,858,197

The funds received for the debt retirement and reserve for contingency charges were invested by the OWRC Investment Committee in accordance with the requirements of the OWRC Act.

The interest money received from Billings was used by the Commission to repay, in part, the liability of the OWRC for interest on funds borrowed from the Province, while the amount received for operations was used to pay the operating costs of each project. Continued assistance was provided to municipalities by the staff of the Division of Finance in the installation of accounting and billing systems, and the instruction of municipal staff in the maintaining of records.

Payroll and Machine Accounts

The activity of this section continued to increase due to the growth of Head Office and Project Operations staff, and the Head Office and Project Operation expenditures.

Project Operation Expenditures

The number of projects increased from 225 at January 1, 1965, to 255 at December 31, 1965. Monthly operating statements were produced for the majority of these projects.

Contract Payments and Records

During the year, this section processed for payment 461 contract certificates totalling \$11,366,570; 325 engineering certificates totalling \$1,067,322 and 1,165 miscellaneous invoices totalling \$3,400,761, for a grand total of \$15,834,653.

Tender calls made during the year amounted to 48. During the same period, 52 contracts including 10 test-drilling and observation well contracts were awarded in the total amount of \$24,369,734.

Subsidies in respect of the 1964/65 Winter Works Program were made on behalf of 19 municipalities, with 21 claims being filed, for an estimated subsidy of \$443,359.20. Also, applications were made for a rebate of Provincial Sales Tax on behalf of 37 projects in the total amount of \$123,861.

Purchasing Section

An increase in the number of Commission water and sewage projects in operation resulted in an increase of 18.5 per cent in purchase orders issued in 1965 over the 1964 figures.

	<u>Number of Purchase Orders Issued</u>	
	<u>1964</u>	<u>1965</u>
Head Office Purchases	2,474	3,803
Project Operation Purchases	3,578	4,187
Project Construction Purchases	<u>1,167</u>	<u>565</u>
	7,219	8,555
	<hr/>	<hr/>
<u>Increase</u>		18.5%
		<hr/>

ONTARIO WATER

(CONSTITUTED BY SPECIAL ACT

BALANCE

AS AT

ASSETS

CAPITAL ACCOUNT

CASH IN BANK	\$ 936,601.43
RECOVERABLE ADVANCES	42,568.52
ACCOUNTS RECEIVABLE	2,041,744.37
CAPITAL ASSETS:	
COMPLETED PROJECTS OWNED BY ONTARIO WATER RESOURCES COMMISSION	56,090,941.43
CAPITAL ADVANCES FOR COMPLETED MUNICIPAL PROJECTS	21,077,677.85
CONSTRUCTION IN PROGRESS	8,704,738.46
AMOUNTS DUE FROM RESERVE ACCOUNT	<u>45,318.10</u>
	<u>\$88,939,590.16</u>

RESERVE ACCOUNT

CASH IN BANK	\$ 220,812.85
ACCRUED INTEREST RECEIVABLE	24,419.97
INVESTMENTS, AT AMORTIZED VALUE (MARKET VALUE \$2,202,449.39)	<u>2,275,892.73</u>
	<u>\$ 2,521,125.55</u>

DEBT RETIREMENT ACCOUNT

CASH IN BANK	\$ 476,313.07
ACCRUED INTEREST RECEIVABLE	84,675.91
INVESTMENTS, AT AMORTIZED VALUE (MARKET VALUE \$5,997,813.13)	6,205,479.43
AMOUNTS DUE FROM CAPITAL ACCOUNT	<u>16,608.38</u>
	<u>\$ 6,783,076.79</u>
	<u><u>\$98,243,792.50</u></u>

NOTE: AS AT DECEMBER 31, 1965 COMMITMENTS HAD BEEN MADE UNDER FINAL AGREEMENTS EXECUTED FOR THE CONSTRUCTION OF PROJECTS REQUIRING ADDITIONAL GROSS EXPENDITURES OF APPROXIMATELY \$33,000,000.00.

RESOURCES COMMISSION

OF THE ONTARIO LEGISLATURE)

SHEET

DECEMBER 31, 1965

LIABILITIES

CAPITAL ACCOUNT

ACCOUNTS PAYABLE AND CONTRACT RETENTIONS		\$ 2,700,675.20
ADVANCES FROM MUNICIPALITIES AND OTHERS		
OPERATING AND INTEREST	\$ 1,114,452.15	
CAPITAL	<u>4,922,068.68</u>	6,036,520.83
DUE TO PROVINCE OF ONTARIO		50,000.00
TREASURY DEPARTMENT ADVANCE		80,135,785.75
FUNDED DEBT PAYABLE TO THE PROVINCE OF ONTARIO		
AMOUNTS DUE TO DEBT RETIREMENT ACCOUNT		<u>16,608.38</u>
		<u>\$88,939,590.16</u>

RESERVE ACCOUNT

FUNDS FOR RENEWALS, REPLACEMENTS AND CONTINGENCIES		
UNDER SECTION 43 OF THE ACT		\$ 2,475,807.45
AMOUNTS DUE TO CAPITAL ACCOUNT		<u>45,318.10</u>
		<u>\$ 2,521,125.55</u>

DEBT RETIREMENT ACCOUNT

SINKING FUND FOR THE RECOVERY OF THE COST OF CAPITAL		
ASSETS AT 3 1/2 UNDER SECTION 44 OF THE ACT		\$ 6,783,076.79
		<u>\$ 6,783,076.79</u>
		<u>\$98,243,792.50</u>

Division of Industrial Wastes

R. H. Millest, Director
D. P. Caplice, Assistant Director

The Division of Industrial Wastes was established in April, 1965, with the transfer of the staff of the Industrial Wastes Branch of the Division of Laboratories to this new divisional function. The original complement of 21 was augmented in June by five new staff members.

The staff includes engineers, chemists, and engineers' assistants.

The activities of the Division are divided into two main programs:- (1) field inspection and reporting on industrial waste disposal throughout the Province, and (2) the review and appraisal of plans for industrial waste treatment and disposal facilities, in keeping with the requirements of the OWRC Act for Commission approval of such works. In the course of the field program the staff participated in a number of regional water resources and waste disposal studies in co-operation with the divisions of Sanitary Engineering and Water Resources, and worked closely with the Division of Plant Operations and municipal sewage works authorities in the evaluation and control of waste discharges to municipal sewerage systems.

Summary of Field Activities

The distribution of field workload is shown in the following tabulation. The increase in field coverage, that was made possible by the increase in staff in 1965, is indicated in the right-hand column:

TABLE I

	DIST. 1		DIST. 2		DIST. 3		DIST. 4		TOTAL		PERCENT INCREASE
	1964	1965	1964	1965	1964	1965	1964	1965	1964	1965	
TOTAL FIELD VISITS	116	131	101	151	90	181	100	119	407	582	43
INDUSTRY SURVEYS	40	76	84	101	60	161	52	71	236	409	73.3
MUNICIPAL SURVEYS	2	1	1	2	3	4	1	5	7	12	71.5
COUNTY SURVEYS	1	0	1	1	1	2	1	1	4	4	0
REPORTS ISSUED	31	46	23	25	53	79	24	45	131	195	47.8
MEETINGS WITH INDUSTRIES AND/OR MUNICIPALITIES	16	30	18	45	30	38	25	44	89	152	70.7

As part of the field activities workload summarized in Table I, it is noteworthy that an expanded program of technical assistance to municipalities in the establishment of pretreatment and control of waste discharges to municipal sewers was carried out. Twelve municipal surveys were completed, and, in each case, comprehensive reports were prepared giving detailed information on water use and waste disposal within the municipality. A total of 149 industries were surveyed in this aspect of the Division's work in Cobourg, St. Catharines, Brampton, North Bay, Bradford, Arnprior, Pembroke and Gananoque.

General Notification of Industrial Waste Requirements

The objective of the Commission to establish the control of industrial waste disposal within the same terms of reference as those which apply to the control of municipal wastes led to the widespread circulation of information letters setting out the terms of the OWRC Act for pollution control and the degree of industrial waste control that was to be achieved. A schedule of industrial waste control objectives was drawn up and mailed to 470 industries, 456 municipalities, and 386 industrial commissioners or industrial procurement officers. A schedule of industrial plant visits was set out, and, at the year end, about 80 percent of the industries receiving the letter had been visited by field staff and were advised of the applicability of the objectives to their specific waste disposal conditions.

The communication with the municipalities advised of the local responsibility for the control of waste discharges to sanitary sewerage systems and recommended the enactment of a suitable municipal sewer-use by-law for this purpose. A suggested schedule of control limits was made available and, in many instances, municipal personnel consulted with the staff of the Division in the preparation of by-laws.

The control of industrial wastes, as a requirement of new industry location, was brought to the attention of industrial commissioners as a major part of the program of controlling municipal sewer-use and preventing further water pollution at the outset of new industrial operations. The response was good, with most new industrial developments being brought to the attention of the Commission through the submission of formal waste treatment and disposal plans.

With the objectives for industrial waste control having been brought directly to the attention of industry throughout the Province, consultations with industries at which waste control was deemed unsatisfactory were intensified with a view to establishing positive programs for prompt control. Because of technical or cost considerations, staged programs in some instances were considered. Time-schedules for planning, engineering, construction, and completion of works are being established as consultations continue with industrial management.

Pulp and Paper Industry Directive

Studies made by the Commission over the past number of years formed the basis for a schedule of waste treatment and control objectives that was sent to all pulp and paper companies operating mills in Ontario. Because of the magnitude and complexity of the water pollution problems facing many of the operating mills, the industry established a committee of senior management to consult with the Commission, and to evaluate the industry problem on a province-wide basis. A technical task committee was accordingly established by the industry and its report, setting out data on 42 mills in the Province, was submitted to the Commission at the year-end. Progress in waste control since 1960 was documented, together with proposals that have been made by the member companies to meet the Commission's objectives for treatment.

Chemical and Oil Industry

Industries of this type in the Sarnia-St. Clair River area have been the subject of frequent surveys during the past number of years. A complete review was made of all sources of industrial wastes in 1965 to correlate waste loadings with river quality and flow data that were collected simultaneously by the Water Quality

Surveys Branch of the Division of Sanitary Engineering. These industries continued to maintain close self-control through the industry-sponsored St. Clair River Research Committee, and reported monthly waste analyses to the Commission on an individual basis.

Detailed surveys were also conducted at the four central Ontario oil refineries located west of Toronto to evaluate the efficiency of waste treatment processes being used at each plant. In all cases, the results indicated that a high degree of treatment efficiency was being achieved, and, as with the St. Clair River industries, monthly waste analysis reports were submitted to the Division by each industry.

Steel Industry

Extensive waste disposal surveys in the iron and steel producing industry have been followed by the development of programs of treatment and control by that industry to meet the objectives of the Commission. Staging of the measures to be taken has been indicated in proposals submitted to the Commission which will permit integration of waste treatment and control with modifications to existing production facilities or incorporation into new units of planned production expansion.

Progress in waste control in the Hamilton area is noteworthy. Completion at the Steel Company of Canada of a new closed-system hydrochloric acid pickle line, from which acid and iron are both recovered, points out the advantage of new techniques whereby waste is eliminated at the production source. A decision as to the treatment of existing sulphuric acid pickling wastes or replacement with the new hydrochloric acid process is to be made on the basis of operating data now being gathered.

Proposals by Dominion Foundries and Steel Co., Limited, similarly indicate consideration of a change to hydrochloric acid pickling with acid recovery. Other measures that have been proposed, or are under development, include biological treatment of phenolic and cyanide wastes, clarification of solids-bearing wastes, and control of oil losses to sewers.

Mining Wastes

Studies were continued in co-operation with the Department of Mines, the Department of Health, and the uranium mining industry to improve the control of mill tailings disposal and to establish treatment methods to control the

discharge of radio-active components of the wastes. Continuing studies by the three operating companies in the Elliot Lake mining camp led to the development and successful application of the treatment of wastewaters with barium chloride. Commission approval of one completed installation of this type was requested at the year-end.

Large-scale developments in iron mining and pelletizing were kept under close examination as existing operations continued in the Steep Rock, Sudbury, Kirkland Lake, and Marmora mining areas. New developments at Temagami, Sudbury, Timmins and near Red Lake were reviewed in detail prior to property development to ensure that adequate treatment and control of wastes was incorporated in production plans.

The processing of unrefined ores, particularly the milling of gold, uranium, iron and base metal ores, produces large quantities of liquid and solid wastes (tailings) which contain concentrations of suspended solids and toxic ions in excess of the limits outlined in the Commission's "Objectives for Industrial Waste Control". Standard practice in the mining industry over the years has been to impound these wastes by the construction of dyked retention systems and to discharge a clear effluent to the receiving waters. As an aid in the preparation of applications for industrial waste treatment and disposal systems in which such embankment or impoundment is to be used, staff of the Division prepared a mining industry guide setting out minimum specifications for the construction of tailings impoundment dykes.

Design Approvals

Control of industrial waste disposal is exercised by the requirement of Commission approval with respect to new works for the collection, transmission, treatment, and disposal of industrial wastes. Certificates of Approval are issued in the same manner as for sewage works.

During the latter half of the year, fifteen Certificates of Approval were issued for the installation of works costing a total of \$3,473,700. Five other applications were received for works that had been completed and for which approval certificates were not issued. Eight further applications were received at the year-end and were being processed for completion in 1966.

INDUSTRIAL CERTIFICATES OF APPROVAL ISSUED IN 1965

CERTIFICATE OF APPROVAL	INDUSTRY	MUNICIPALITY	COST	DATE ISSUED	WORK TO BE CON- STRUCTED BY	PROJECT DESCRIPTION
65-C-7	NORTHERN WOOD PRESERVERS	PORT ARTHUR	\$ 31,000	JULY 19, 1965	NOV., 1965	PHENOL OXIDATION TREATMENT PLANT
65-C-8	CANADA WIRE & CABLE CO., LTD.	MARKHAM TWP.	19,000	JULY 27, 1965	SEPT. 30, 1965	CLOSED CIRCUIT WASTE SYSTEM INCLUDING SLUDGE LAGOON
65-C-9	STEEL COMPANY OF CANADA LTD.	HAMILTON	175,000	AUG. 4, 1965	OCT., 1965	SCALE PIT AND LAGOON FOR SOLIDS REMOVAL
65-C-14	DU PONT OF CANADA (FINISHED DIV.)	AJAX	18,000	AUG. 23, 1965	OCT., 1965	SOLIDS REMOVAL AND PH ADJUSTMENT
65-C-15	GREAT LAKES PAPER COMPANY, LIMITED	FORT WILLIAM	350,000	SEPT. 7, 1965	DEC., 1965	UNDERWATER DIFFUSER OUTFALL TO SERVE NEW BLEACHED KRAFT MILL
65-C-16	DEHAVILLAND AIRCRAFT OF CANADA LIMITED	MALTON	220,000	SEPT. 28, 1965	JUNE, 1966	DESTRUCTION OF CYANIDE AND CHROMIUM WASTES, PH ADJUSTMENT AND SOLIDS REMOVAL
65-C-17	GRACE PLASTICS LIMITED	CORNWALL	32,000	OCT. 4, 1965	SEPT., 1966	DISCHARGE SEWER AND NEUTRALIZA- TION SYSTEM
65-C-18	TEXAS INSTRUMENTS INC.	RICHMOND HILL	2,600	OCT. 4, 1965	OCT., 1965	NEUTRALIZATION OF WASTE ACID
65-C-19	ONTARIO NORTHLAND TRANSPORTATION CO.	NORTH BAY	24,000	OCT. 22, 1965	DEC. 1, 1965	SEPARATE SEWER SYSTEM FOR CON- TAMINATED FLOWS
65-C-20	EAST SIDE PLATING COMPANY, LIMITED	TOWNSHIP OF SANDWICH EAST	55,000	NOV. 2, 1965	JAN. 1, 1966	CHROMIUM REDUCTION AND SOLIDS REMOVAL
65-C-21	ZENMAC METAL MINES LIMITED	SCHREIBER	10,000	NOV. 9, 1965	SPRING OF 1966	TAILINGS DISPOSAL POND
65-C-22	CHESAPEAKE & OHIO RAILWAY COMPANY	ST. THOMAS	5,600	NOV. 30, 1965	JULY, 1966	OIL REMOVAL AND COLLECTION SYSTEM
65-C-23	ABEX INDUSTRIES OF CANADA LTD.	LINDSAY	10,000	NOV. 30, 1965	SPRING, 1966	RENOVATION OF DUST COLLECTING SYSTEM
65-C-24	COW & GATE CANADA LTD.	GANANOQUE	21,500	DEC. 7, 1965	JULY, 1966	SEPARATION OF CONTAMINATED AND UNCONTAMINATED WASTE FLOWS, TREATMENT AND DISPOSAL
65-C-25	STEEL COMPANY OF CANADA	DIST. OF KENORA (BRUCE LAKE)	2,500,000	DEC. 22, 1965	JUNE 30, 1966	DEVELOPMENT OF IRON ORE BODY AT BRUCE LAKE INTO MINE AND PREPARA- TION OF SOUTH PORTION OF BRUCE LAKE AS A SETTLING BASIN FOR CLAY DREDGINGS AND TAILINGS

Division of Laboratories

J. H. Neil, Director
J. G. Duncan, Assistant Director

In 1965, changes were made in the organization of the Commission. F. A. Voegel, Director of the Division of Laboratories, was promoted to the position of Assistant General Manager. To fill the vacancy, John H. Neil, Supervisor of the Biology Branch, was appointed Director and J. G. Duncan, Supervisor of the Purification Processes Branch, became Assistant Director. At this time the Industrial Wastes Branch was elevated to a divisional status and the Purification Processes Branch was transferred to the Division of Research.

In order to accommodate the increasing quantity and complexity of the work of the Division, some internal changes in organization were made.

At the year end, there was a staff of 70 in the Division. This was composed of 18 scientists and engineers including chemists, biologists, bacteriologists, chemical engineers, 43 technicians and 9 clerical staff.

Since the inception of the Commission, the laboratory work load has grown rapidly with 5915 samples being analyzed in 1956 compared with 67,405 in 1965.

	No. of Samples		No. of Determinations	
	1964	1965	1964	1965
Bacteriology	22,603	29,647	37,581	43,205
Biology	1,086	2,069	1,975	2,447
Chemistry, Total	27,661	35,689	(145,834)	(211,043)
Chemistry (1)	-	-	131,105	187,023
Chemistry (2)	-	-	14,729	24,020
	51,350	67,405	185,390	256,695

While the numbers of samples processed is indicative of the increasing work load, it does not fully describe the important field work carried out by the Biology Branch or the special detailed and complex studies made by the Chemistry and Bacteriology Branches.

In August, a field laboratory was brought into operation to provide analytical services for the co-ordinated program of Great Lakes studies with the International Joint Commission. This laboratory was established in the OWRC Union Water Plant near Kingsville. By mid-December, when sampling was suspended, approximately 2,900 samples had been analysed for 12 chemical, bacteriological and biological parameters. This program will expand to two laboratories in 1966 to provide laboratory services for both Lake Ontario and Lake Erie.

Educative services are an important function of the Division. In the past year, lectures were given at the OWRC water and sewage treatment plant operators' courses and a number of lectures and tours of the laboratory were provided for university and secondary school classes. A demonstration of chemical analyses was provided for the OWRC booth at the Canadian National Exhibition and the Biology Branch again prepared an effective demonstration of typical life in clean

and polluted waters. Several papers of importance were presented to scientific meetings and several published in scientific journals. A chemist from Thailand, who is receiving training in sanitary chemistry in Canada through the Colombo Plan, has been assigned to the laboratory for a year.

Improvements in service through automatic analyses are currently under study and more extensive field investigations are planned. Changes in the existing laboratory building have been requested of the Department of Public Works to facilitate handling the increased work load.

BIOLOGY BRANCH

The Biology Branch expanded its survey program in 1965 reflecting the increased emphasis placed by the Commission on monitoring the effects of waste discharge on rivers and streams throughout the Province. Detailed biological studies were completed on the Avon River, Speed River, Lower Thames River, Upper Credit River, Don River (East Branch), Holland River, Lake Simcoe, and on a number of lakes and streams in the Sudbury area.

Several special studies were undertaken often in conjunction with other divisions and branches of the Commission. A preliminary examination of the effects of lagoon effluents on receiving streams was carried out in co-operation with the Division of Research. Also, a comparison of primary production (rate of algal production) was made in Dunlop Lake and Quirke Lake in the Elliot Lake area in order to obtain data on changes brought about in a poorly buffered northern lake by acidic mining and milling wastes. Samples of water, sediments, plankton, invertebrates and fish were collected from the Holland River for pesticide determinations. A project designed to determine concentrations of phosphorus at varying volumes of flow in several streams north of Metropolitan Toronto and to compare levels of phosphorus in streams flowing through urbanized and predominantly agricultural areas was undertaken.

The Branch was involved in assessing raw water quality for a number of municipalities. Regular algae enumerations on samples from Orillia, Bracebridge, Sault Ste. Marie, Grand Bend and Elliot Lake were made. Similar programs were organized for Azilda, near Sudbury,

and for a new mining townsite in the vicinity of Timagami. A detailed investigation of the water supply system for the Town of Alexandria was carried out in co-operation with the Technical Advisory Services Branch of the Division of Research. The Branch co-operated with the Division of Sanitary Engineering and the City of Sudbury in organizing an algae control project in Ramsey Lake, source of water supply for this municipality. Some 58 tons of copper sulphate were used successfully to eliminate troublesome taste-and odour-producing blue-green algae from the lake.

A thorough program of evaluation, involving three aquatic herbicides, was commenced in early spring and continued until fall. One chemical was found to be effective in controlling both algae and submergent leafy vegetation in farm ponds and the other two chemicals provided excellent control of aquatic vegetation at suitable rates in open-water situations in the Kawartha Lakes. Fish and other aquatic life were not adversely affected by the chemicals. Recommendations based on these studies were advanced and accepted at the annual meeting of the Advisory Committee on Herbicides for Ontario, and will be incorporated into 'Guide to Chemical Weed Control, 1966' - Publication 75 of the Department of Agriculture.

Unightly conditions created by excessive growths of aquatic vegetation at the Town of Gananoque were investigated and appropriate recommendations made to remedy the situation. Similar nuisance growths of aquatic vegetation, as well as other troublesome aquatic populations such as algae, coarse fish and leeches, led to numerous enquiries from the general public concerning suitable control procedures. During 1965, a total of 41 permits was issued by the Commission to authorize the application of chemicals to water. Of the 41 permits, 29 were issued for algae and aquatic plant control, nine for the control of leeches, black flies and mosquitoes and three for the elimination of coarse fish populations.

Several municipalities continued to send in information on algae enumerations completed at water treatment plants as a contribution to a better understanding of algae conditions in the waters of the Province. An Algae Identification and Enumeration Course, of one week's duration, was offered by the Branch in November, and was attended by representatives from eight municipalities. A system was established so that all samples submitted to the OWRC laboratory for algae enumerations are counted, concentrated in small vials, and retained permanently on file for future reference.

The Biology Branch was responsible for carrying out studies related to control of algae Cladophora in the Great Lakes, a program administered by the Division of Research, and reported elsewhere in this report. Other work related to the Great Lakes, involving analyses of samples submitted to the laboratory for plankton enumerations, constituted the Branch's contribution to the Great Lakes Survey Program.

In the toxicity and bioassay section, a total of 91 separate bioassays was completed throughout the year on industrial wastes, pesticides and surface water samples. Nine chemicals were screened for algicidal activity against algae Cladophora. This section also conducted work related to the palatability of fish flesh in two areas affected by discharges from paper mills.

A paper dealing with plankton conditions and changes in water chemistry in Lake Ontario was delivered at the Eighth Conference on Great Lakes Research, and another outlining the use of opaque plastic for controlling growths of aquatic vegetation was presented at the annual meeting of the Aquatic Weed Control Society. Other papers prepared by personnel of the Branch for publication included one on fish population estimates, published in the Transactions of the American Fisheries Society, and another on control of aquatic plants in farm ponds, published in the Progressive Fish-Culturist.

Three biologists spent one day lecturing at the Forest Ranger School at Dorset. Other educational work included the establishment and maintenance of the biology exhibit at the Canadian National Exhibition.

BACTERIOLOGY BRANCH

The work of the Bacteriology Branch was of a 71% routine and 29% non-routine nature. The routine work was mainly in the form of analyses for members of the coliform group of bacteria, while the non-routine was mainly taxonomy.

Projects

The Branch undertook a number of projects throughout the year. In conjunction with pilot plant installations by the Division of Research, the efficiency of bacterial

removal by these small filter units was determined. Analyses to determine the elimination of coliform, fecal coliforms and fecal streptococci from a simulated sewage lagoon was another service provided to that Division. Studies were conducted on phenol-consuming organisms. Methods for determining the sterilizing power of industrial waste waters, which might have an adverse effect on the operation of a sewage treatment plant, were investigated.

As a result of the increased use of chlorine dioxide, some doubts regarding its bactericidal properties, and the confusion existing in literature, a study to assess its activity was undertaken. The practical use of an ultra-violet light germicidal unit for disinfection of water was another project initiated in the latter part of the year.

Other unusual requests for bacterial analysis consisted of the examination of ice cubes from vending machines, of water in plastic balls and other decorative shapes used in cooling beverages, and of water present in teething rings used by infants.

Special analyses, taxonomic microbiological work and routine biofouling studies were carried out.

Material was prepared on the feasibility of using Electronic Data Processing (E.D.P.) techniques to facilitate and improve current methods of recording, retrieving and statistically analyzing laboratory data.

A detailed bacteriological survey of alleged pollution in the Thornbury-Collingwood area was made in conjunction with the Division of Sanitary Engineering and the Grey County Health Unit.

The Cotter Street iron removal plant in Newmarket was visited to assess the degree of interference of substantial growths of filamentous bacteria to this process.

An investigation of reported high populations of Pseudomonas bacteria in the Toronto water supply was made on selected samples. These organisms were found to be relatively few in numbers in Toronto City water but are natural inhabitants of Lake Ontario water.

Great Lakes Field Laboratory - Kingsville

A field laboratory in the Union Water Plant near Kingsville, Ontario, was set up to carry out water quality evaluation studies of western Lake Erie and the Detroit River. The bacteriological section of this laboratory was manned by one

permanent technician and one summer student technician. Water samples were examined for coliform organisms only, but consideration has been given in future work to extend the range of analytical tests to evaluate other types of bacterial flora present in the Great Lakes. This field laboratory was operational from July to early November.

Routine Laboratory - Appraisal and Expansion of Analytical Tests

The development of other methods to assess water pollution has been a continuing task of the Bacteriology Branch. An extensive evaluation program of fecal coliform and fecal streptococci was undertaken during the past year. The adoption of a routine analysis for fecal coliform bacteria, in addition to the present coliform analysis, was considered both feasible and valuable with regard to certain types of samples.

The study of an alternative method for determining the presence of coliform organisms in municipal water supplies, in comparison with the Membrane Filter procedure, was investigated. This test was to indicate the presence of coliform organisms in a water which contained either small numbers of coliforms or those which were in a state of reduced viability, and was found to be particularly applicable to certain treated water supplies. Testing is to be completed in 1966 when recommendations for general use may be made.

Taxonomic Microbiological Investigations

The investigations of nuisance bacteria were continued with emphasis being placed on methods of cultivation of iron bacteria, "sulphate-splitting" bacteria, slime-forming bacteria and actinomycetes. Attention was also given to the growth of molds, anaerobic bacteria and phenol-decomposing bacteria. Stock reference collections of these microorganisms were maintained and supplemented and practical methods for their identification were examined to facilitate the increased number of requests for nuisance organism examinations.

A considerable amount of time was devoted to a study of methods to group and classify members of the Enterobacteriaceae, and other bacterial families associated with microorganisms found in water. Techniques for differentiating Gram-negative bacteria, particularly with regard to distinguishing coliform bacteria from "pseudo-coliform" bacteria, were evaluated. Rapid identification,

grouping and/or enumeration of bacterial isolates representing the spectrum of microorganisms found in different types of water should prove useful for eutrophication and bioecological studies which have been assuming increasing importance in the scientific literature.

Other pollution parameters studies during the year were fecal coliforms and fecal streptococci (enterococci). Literature surveys helped the Branch to keep abreast of advances made in the examination of water and waste water for pathogenic bacteria, bacteriophages and pathogenic viruses, as well as recent techniques in bacterial phagetyping, serological typing and fluorescent antibody typing. Micromanipulation techniques were also being considered to permit single cell isolation of bacteria, fungal spores and other microbial elements of importance in bio-fouling problems.

Instruction and Lecture Work

Tours, lectures and laboratory demonstrations were arranged for a number of groups. Several series of slides, which illustrated basic analytical procedure and other material of a microbiological interest, were prepared for bacteriological reference and lecture work. Permanent pictures of bacterial growth of different media, and under multiple environmental conditions, and of the morphology of molds and actinomycetes, have been prepared for reference information.

Inquiries from Private Individuals and other non-OWRC Agencies

The Branch routinely provides information pertaining to the interpretation of bacteriological results, methods of disinfecting well water supplies and acceptable bacteriological levels for recreational swimming and other uses. Requests for information on the value of silver impregnated filters and the effectiveness of septic tank starters were also received.

Examination of Water for Viruses

Interest in virus particles in drinking water and surface waters, and their survival in sewage treatment systems, prompted a thorough investigation of current scientific literature. The requirements for handling some of these investigations were being studied. Preliminary work on the use of bacteriophage as indicators of disease organisms and viral removal was done. Literature investigations on the use of these viral particles was encouraging.

CHEMISTRY BRANCH (1) - WATER AND SEWAGE ANALYSES

Chemistry Branch (1) is made up of the pollution and water analysis sections of the main chemistry laboratory, together with the chemistry section of the Great Lakes Water Quality Field Laboratory.

The decision to set up a field laboratory for the Great Lakes Water Quality Surveys work provided a valuable addition to laboratory facilities. Another promising development was the decision by the Department of Public Works to proceed with revision of laboratory space at the main laboratories. Plans, which were provided to that Department in detail, call for a reorganization of space within the sections of Chemistry Branch (1), aimed at providing more effective procedures for processing the masses of sample arrivals. In particular, automated instrumental procedures are expected to be developed for those tests presently performed in the greatest numbers.

The Branch was requested to develop and staff a laboratory exhibit at the Canadian National Exhibition. It was decided to install an actual working laboratory so that the staff assigned to this project could continue to perform their normal work. The exhibit provided both an efficient working area and maximum visual effect for spectators. A total of 1,773 tests were performed at the exhibit, allowing incoming analytical work to be kept completely up to date during this period.

Monthly test totals throughout the year are shown for each section on Graph 1. The extension of heavy sampling activity through the summer and fall is shown, together with the substantial numbers of tests performed at the Great Lakes Water Quality Survey field laboratory at Kingsville.

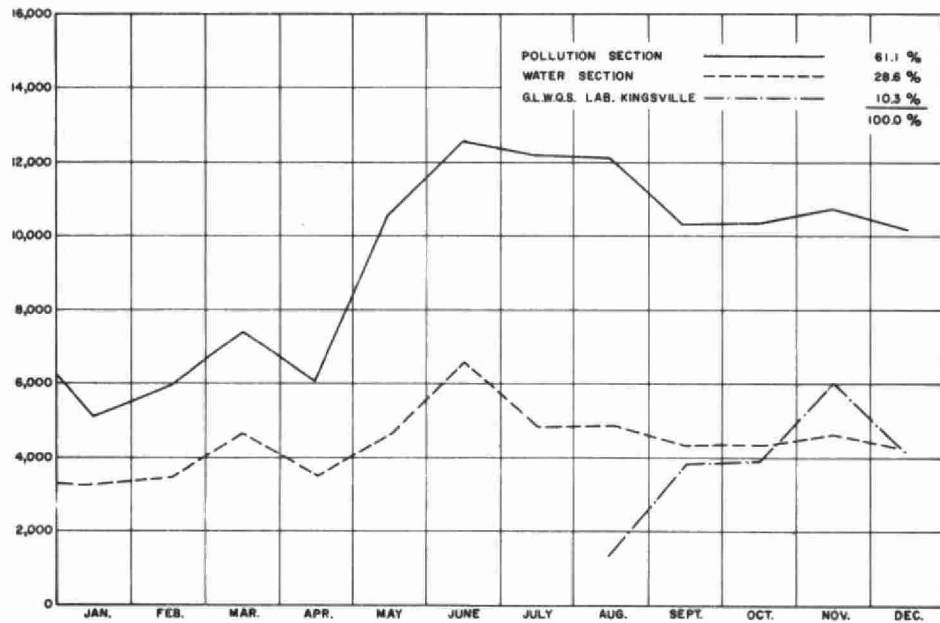
The combined test totals for the Branch are shown in Graph 2. Compared to the previous year, total output increased each month, with particularly substantial gains being achieved in May and June, and again through the last three months of the year. As a result, the normal seasonal decrease in analysis during the fall was reversed, and, with the inclusion of Great Lakes survey work, a continual acceleration in output through the last half of the year was recorded, resulting in a substantial average increase over the year.

CHEMISTRY BRANCH I

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WATER AND SEWAGE ANALYSIS

SECTION TEST TOTALS



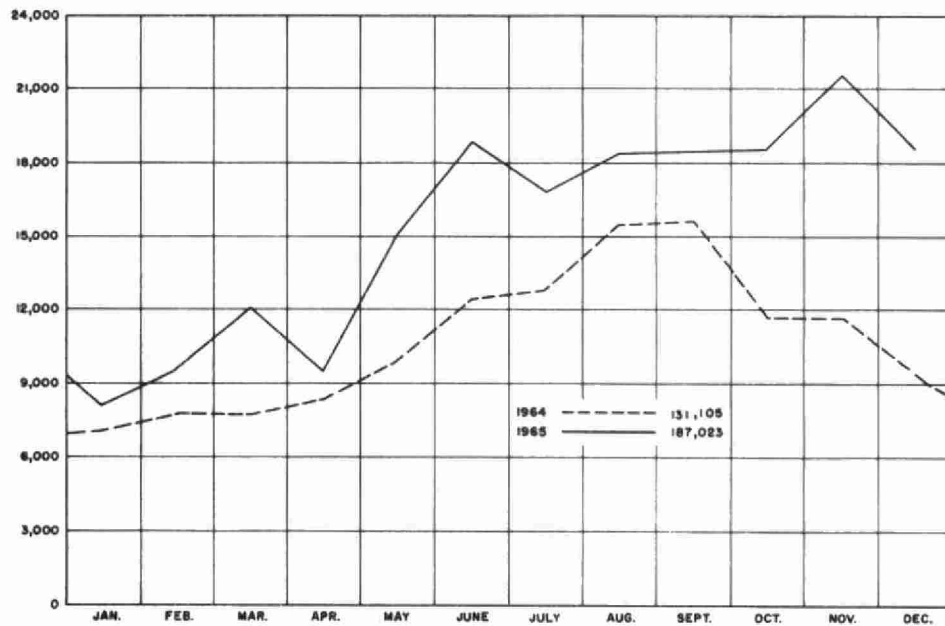
GRAPH 1

CHEMISTRY BRANCH I

WATER AND SEWAGE ANALYSIS

MONTHLY TEST TOTALS

COMPARISON 1964 - 1965



GRAPH 2

CHEMISTRY BRANCH (2) - INDUSTRIAL WASTES ANALYSES

The Industrial Wastes and Organic Sections of the Chemistry Branch were joined together in September into the newly-formed Chemistry Branch (2) Industrial Waste Analyses. Since the work of each section had been tabulated separately before this reorganization, it was possible to compare statistics for 1965 with those of previous years.

Routine Analytical Program

In the Industrial Wastes Section, the overall increase in tests done was due largely to specific tests such as phosphate, anionic detergent, phenolic compounds and the heavy metals on industrial waste samples.

In the Organic Section, ultra-violet and infrared spectroscopy was used for analyses of many organic compounds in water, including petroleum hydrocarbons. Additional accessories were ordered for the infrared machine and the acquisition of a recording ultraviolet-visible spectrophotometer in the near future will improve the development and investigative capacity of this section. Sodium and potassium analyses (done by flame photometry) were transferred to the other section of the Chemistry Branch in November as these tests referred mainly to water quality studies.

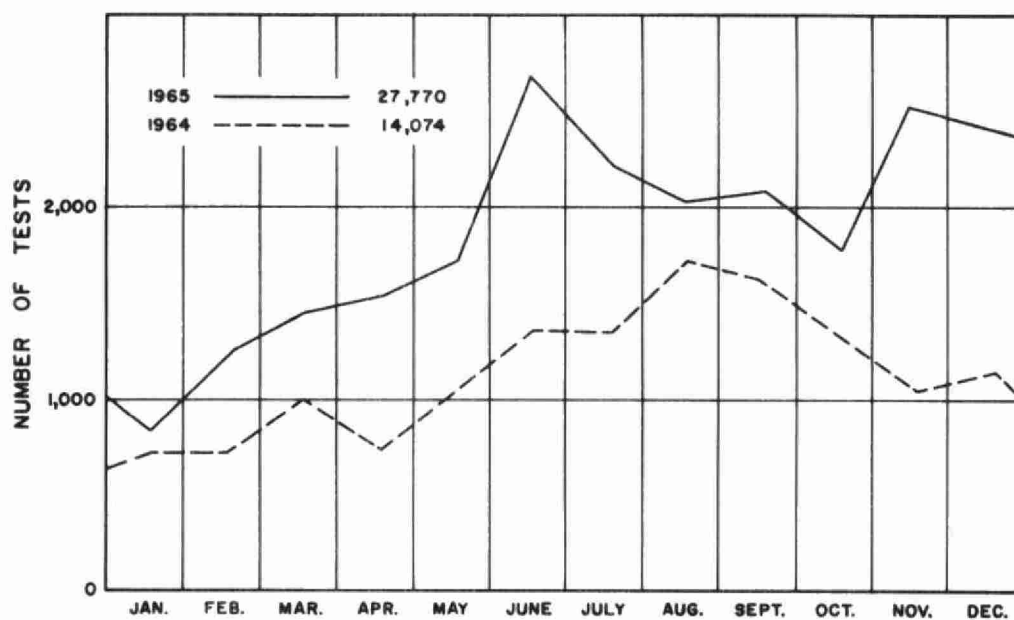
Method Evaluation and Development

In spite of the heavy demand for routine analyses, some development work was possible and several new procedures were evaluated.

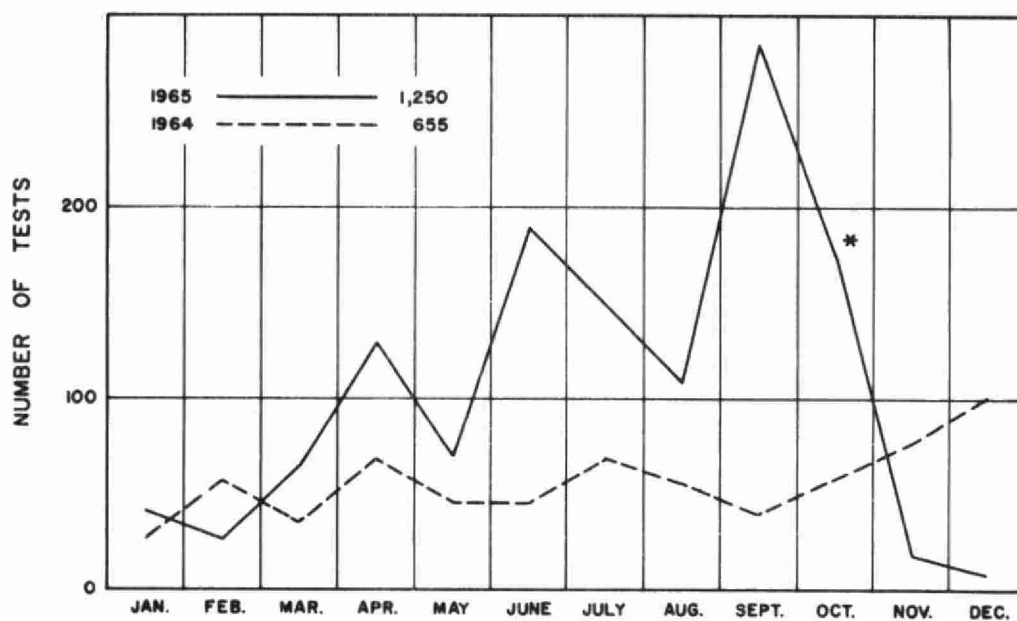
In the Organic Section, spectroscopic methods were adopted for herbicides such as 2,4-D, 2,4,5-T and atrazine. A method for differentiating between natural gas and gasoline in water was used successfully. Preliminary work on the analysis of uric acid in water, a suggested indicator of domestic pollution, was started for the Bacteriology Branch.

In the Industrial Wastes section, a greater number of metals were being analysed by means of polarography. Metals such as nickel, cadmium, copper and tin were being done on the polarograph with accurate and consistent results. Colorimetric tests were retained for

GRAPH 1: INDUSTRIAL WASTES SECTION
COMPARISON OF MONTHLY TEST TOTALS FOR 1964 AND 1965



GRAPH 2: ORGANIC SECTION
COMPARISON OF MONTHLY TEST TOTALS FOR 1964 AND 1965



* SODIUM AND POTASSIUM TESTS TRANSFERRED TO CHEMISTRY I

those metals not suitable for polarographic determination and where higher sensitivity was required (for example, chromium and manganese). Finally, a new standard method for arsenic was being evaluated which might replace the old modified Gutzeit procedure.

Screening procedures, losses, etc. were investigated in spite of the large increase in routine phenol tests. Appreciable discrepancies were observed at times between OWRC and industries on results that were obtained by the same test on split samples. The modified Gibbs method was found to be subject to both positive and negative interferences, and screening appears to give varying results depending on the type of waste involved. However, discussions with scientists from industries (as in the Sarnia area) have helped to clarify many problems in a spirit of mutual co-operation.

Special Programs

Several visits were made to laboratories and institutions in Canada and the United States, in order to obtain pertinent ideas relating to the proper development of the Organic Section. The scope of this section is to be broadened by the addition of personnel and equipment and laboratory rearrangement so as to extend the laboratory capabilities for the determination of important organic contaminants in water.

Carbon filter studies were carried out this past year on the St. Clair River at Sarnia. Plans have been proposed to expand this program, as it is felt that much good data relating to industrial organic pollution of water can be obtained using this technique. Some of this work will be combined with water quality studies on the Great Lakes. A gas chromatograph in 1966, as a tool for analysis, will aid in the development of these special programs.

General

Intensive study went into the requirements of laboratory space for the new Branch and the optimum redistribution of this space for future needs. Briefly, routine organic and inorganic analyses will be performed in two separate areas, all preparative organic work involving hazardous chemicals in a third area and finally, the spectrophotometric and chromatographic equipment will be placed in a special instrument room.

Two parties, prosecuted this year for pollution of water, were found guilty on the basis of technical data provided by the Organic Section. Two conferences were attended and at one of these a paper dealing with the identification of organics in water was presented.

Summary of Samples Submitted for Chemical Analyses

Samples collected by OWRC staff increased both in numbers and as a proportion of the total laboratory output, while samples collected by others as shown in Graph 1 decreased slightly in numbers, forming a much smaller portion of total samples. It should be noted that at the request of the Commission samples are collected by municipal agencies, including sewage and water treatment plants and Conservation Authorities. The major increase in OWRC sampling was due to samples collected in connection with the Great Lakes Water Quality Survey, from Lake Erie and the Detroit River, these comprising 8.1% of the yearly total.

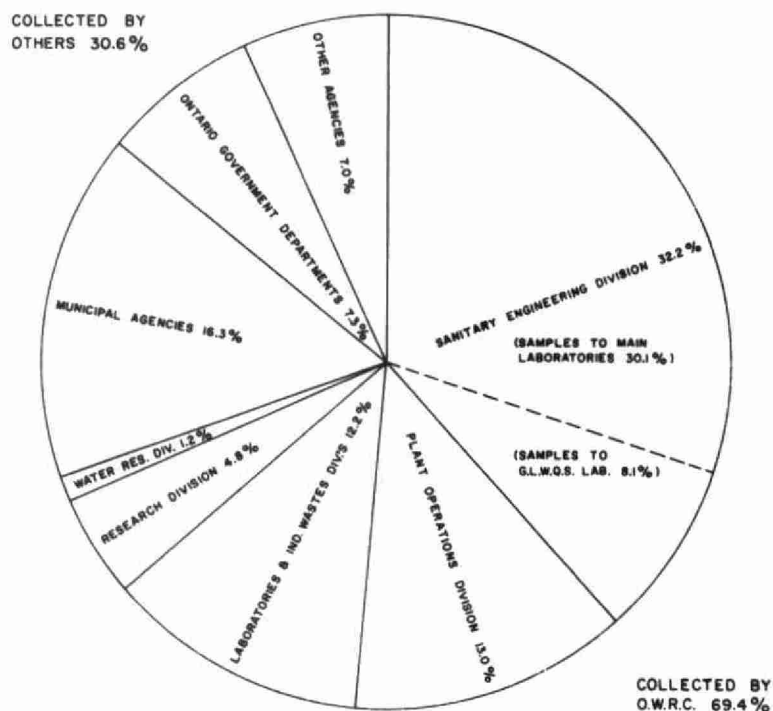
Table 2, which gives the details of sample sources, again reveals the emphasis placed on collection of 'river' samples during the year, with a 1965 total almost double that reached in 1964. Industrial Waste samples also increased substantially.

The abrupt increase in samples during the last two years is shown on Graph 3 together with the even more pronounced rise in tests performed being evidence of the many additional tests now requested per sample. Prominent among these have been requests for analysis for plant nutrients, phosphorus and the various forms of nitrogen.

The distribution of samples through the year is shown in Graph 4. 'River' samples show their characteristic extreme peak during the summer months to an even greater degree than in previous years. Both sewage and water samples show a peak in early summer and an unusual peak again in November. The rapid acceleration of the Great Lakes Water Quality Survey work in the latter half of the year is evident in the graph of these samples.

In Graph 5, the substantial annual increase in samples is shown to be concentrated among the spring and early summer months, and, an unusual development, again in the late fall and winter. Instead of showing a seasonal decline as in previous falls, sampling continued at the same rate as throughout the summer, with a pronounced peak during November.

SUMMARY OF CHEMISTRY SAMPLE SOURCES



	1964		1965	
	Samples		Samples	
Collected by OWRC Staff	Number	(%)	Number	(%)
Sanitary Engineering				
- Main Laboratory	8327	30.1	10758	30.1
- G.L.W.Q. Survey Lab.	-	-	2894	8.1
Plant Operations	4060	14.7	4640	13.0
Laboratories and Industrial Wastes	2552	9.2	4340	12.2
Research	564	2.0	1721	4.8
Water Resources	449	1.6	429	1.2
<u>OWRC Total</u>	<u>15952</u>	<u>57.7</u>	<u>24782</u>	<u>69.4</u>
Collected by Others				
Municipal Agencies	5686	20.6	5809	16.3
Ontario Government Departments	2994	10.8	2598	7.3
Others	3029	10.9	2500	7.0
<u>Total</u>	<u>11709</u>	<u>42.3</u>	<u>10907</u>	<u>30.6</u>
ANNUAL TOTAL	27661	100.0	35689	100.0

CHEMISTRY BRANCH

SAMPLES RECEIVED

1965

<u>Source</u>	Annual Total	<u>Type of Sample</u>			
		Sewage	Water	River	Industrial Wastes
<u>Collected by OWRC Staff</u>					
Sanitary Engineering	13652	3519	1829	(5410	-
(G.L.W.Q. Survey Lab.)		-	-	(2894	-
Plant Operations	4640	4300	295	45	-
Laboratories and					
Industrial Wastes	4340	710	389	755	2486
Research	1721	1717	2	2	-
Water Resources	<u>429</u>	<u>1</u>	<u>418</u>	<u>10</u>	<u>-</u>
 OWRC Total	<u>24782</u>	<u>10247</u>	<u>2933</u>	<u>9116</u>	<u>2486</u>
<u>Collected by Others</u>					
Municipal Agencies	5809	2499	2911	399	-
Ontario Gov't Depts.					
Health	1501	374	948	179	-
Lands & Forests	765	45	28	692	-
Reform Inst.	135	112	23	-	-
Others	197	81	116	-	-
Total	<u>2598</u>	<u>612</u>	<u>1115</u>	<u>871</u>	<u>-</u>
Industries	1145	680	450	15	-
Federal Gov't Agencies	495	414	80	1	-
Private	305	22	274	9	-
Consulting Engineers	265	150	106	9	-
Miscellaneous	<u>290</u>	<u>116</u>	<u>58</u>	<u>116</u>	<u>-</u>
 Total	<u>10907</u>	<u>4493</u>	<u>4994</u>	<u>1420</u>	<u>-</u>
 1965 Total	<u>35689</u>	<u>14740</u>	<u>7927</u>	<u>10536</u>	<u>2486</u>
1964 Total	<u>27661</u>	<u>12590</u>	<u>8140</u>	<u>5444</u>	<u>1487</u>
% Change	+29%	+17%	-3%	+94%	+67%

Table 2

CHEMISTRY BRANCH

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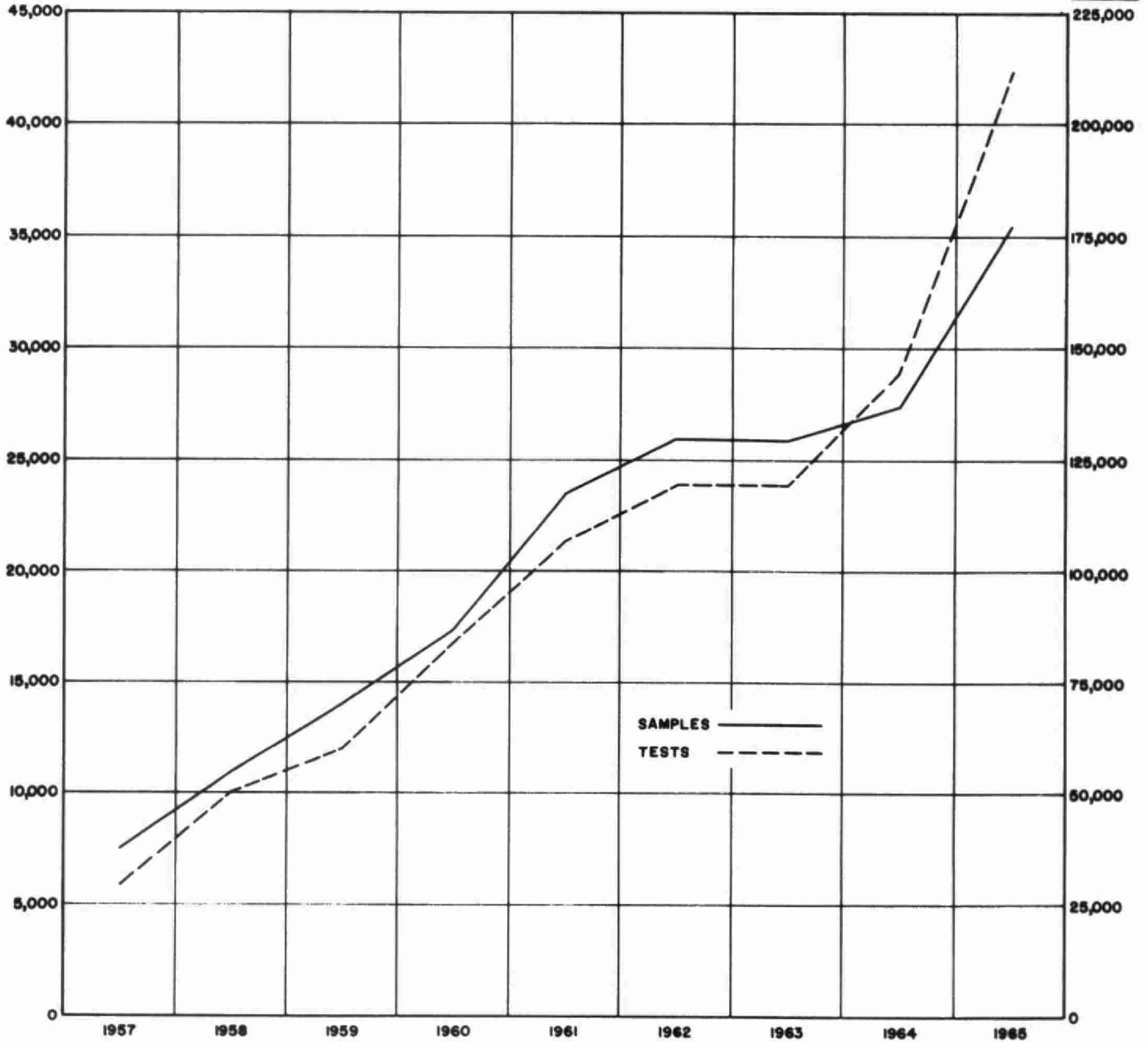
ANNUAL TOTALS

TESTS — SAMPLES

1957 1965

SAMPLES

TESTS



SAMPLES

7,615	11,262	14,077	17,732	23,860	26,109	26,187	27,661	35,689
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TESTS

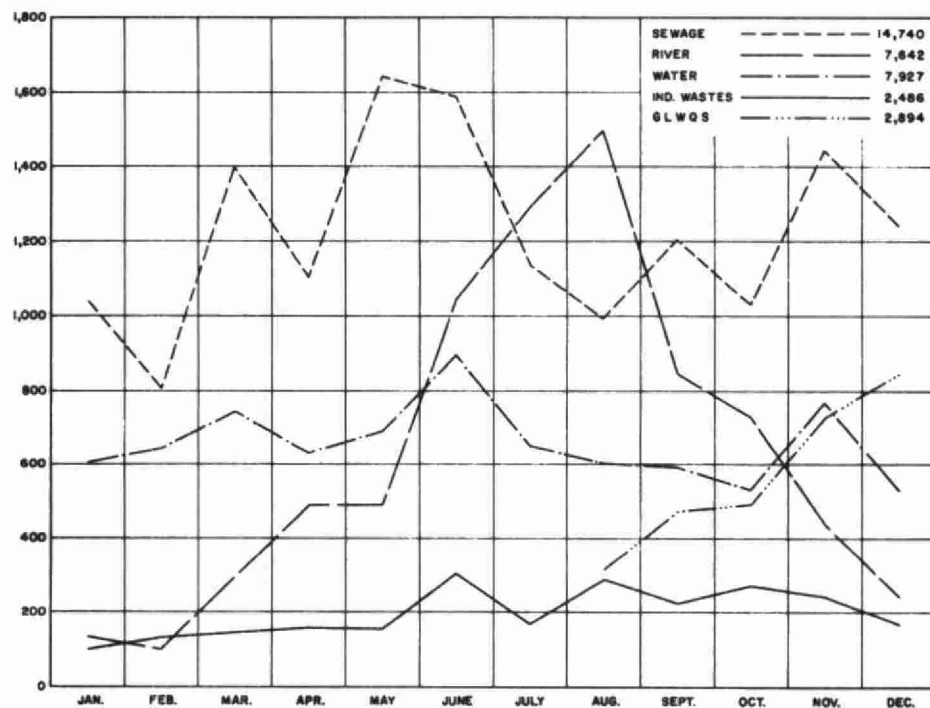
29,365	50,071	62,134	85,529	108,449	119,841	118,801	145,806	211,043
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GRAPH 3

CHEMISTRY BRANCH

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MONTHLY SAMPLES BY TYPE OF SAMPLE

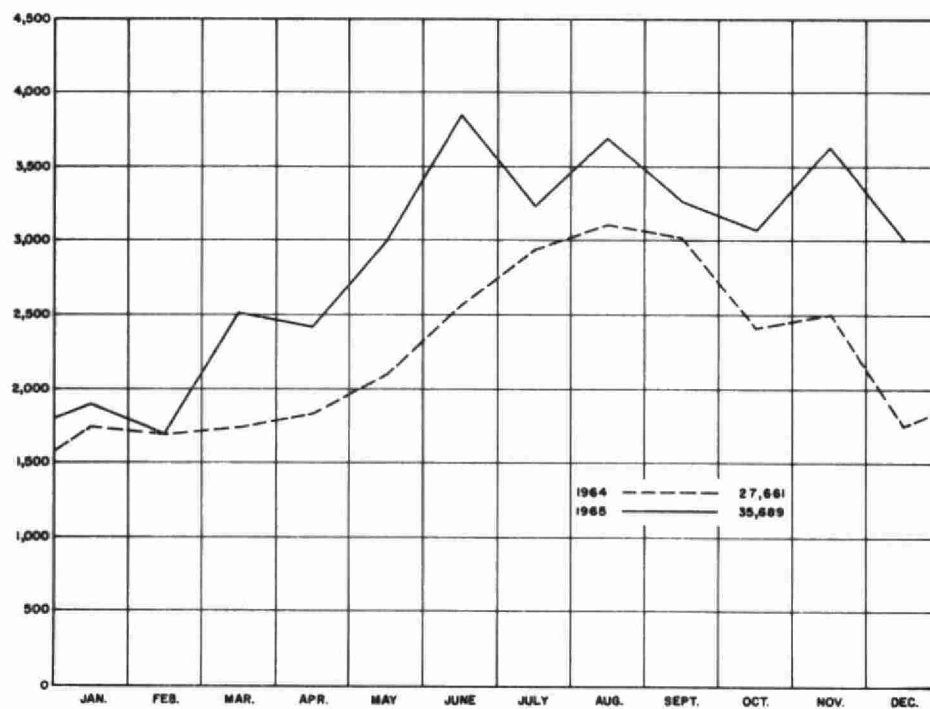


GRAPH 4

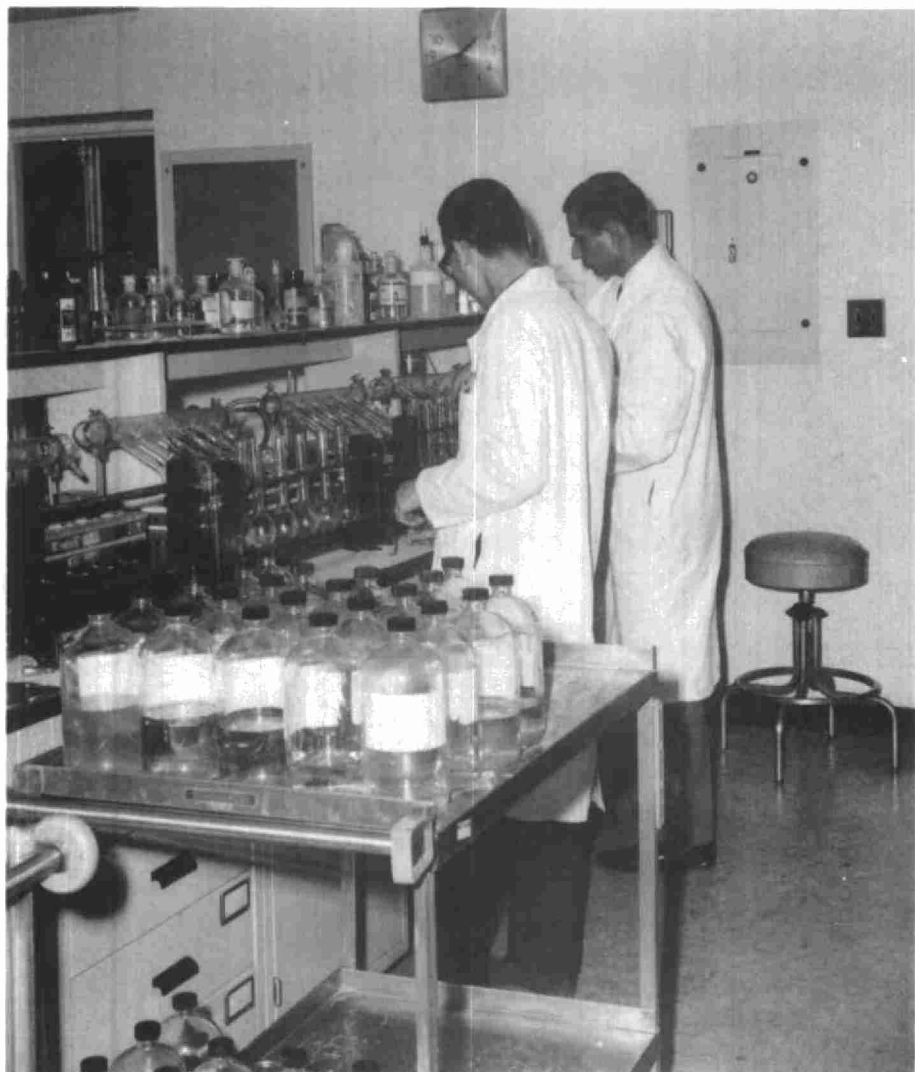
CHEMISTRY BRANCH

MONTHLY SAMPLE TOTALS

COMPARISON 1964 - 1965



GRAPH 5



OWRC laboratories.





Biology laboratory.

Division of Plant Operations

B. C. Palmer, Director
C. W. Perry, Assistant Director

The Division of Plant Operations is responsible for the day-to-day operation of all Commission-financed projects. This is accomplished by a staff of plant operators, attached to the various projects. They report to the Division's Operations Engineers, who are assisted by a staff of specialists which includes mechanics, controls and instrumentation technicians, statistical and inventory clerks, and safety-and-training personnel. Over-all supervision is executed by a Director, an Assistant Director, and two supervisors.

Liaison with Municipalities

Since the direct operating costs, including the salaries of the operators, are charged to the municipalities, the Division co-operates closely with municipal officials to ensure mutual understanding of operating problems and to aim at the highest possible efficiency.

New Trend

The treatment of combined domestic and industrial wastes in pollution control plants is becoming more frequent. This trend is placing greater emphasis on laboratory control of operation and on the need for municipal control of industrial wastes.

During the past year, training programs were intensified at individual plants and at centralized locations. These programs covered process control, equipment maintenance and operator safety.

With the rapid increase in the number of operative projects, significant economies in operating costs are beginning to be realized. Sludge haulage from several adjoining plants is now handled as a unit. Projects are sharing specialized testing and laboratory equipment.

Plant staff are being more economically distributed by transferring them from one project to another as the need arises, and quick communication of operating data to the entire operating staff bring lessons learned in one plant to the aid of other plants having similar problems.

Statistical Summary

Statistics, indicative of the Division's program, follow --

a) Total capital cost of works in operation as of December 31, 1965..

Sewage Projects	\$86,395,075
Water Projects	<u>\$25,468,322</u>
Total	\$111,863,397

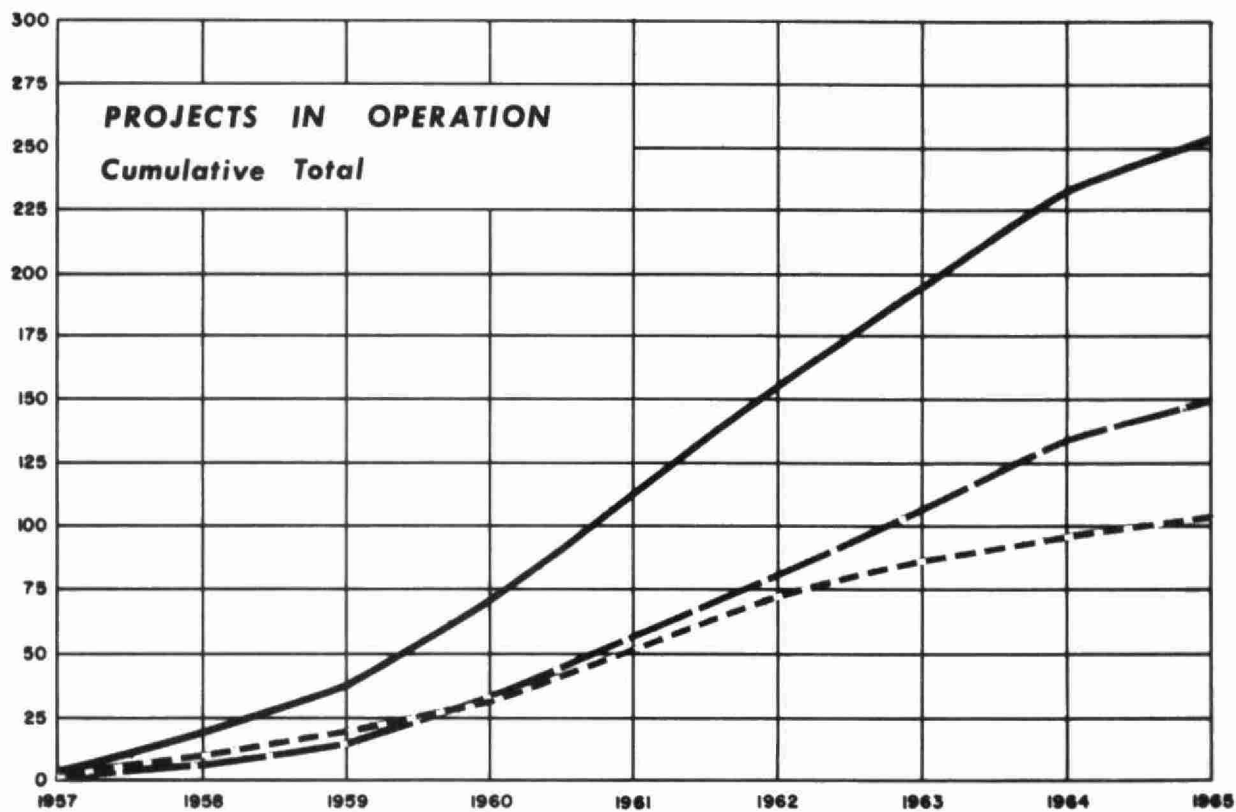
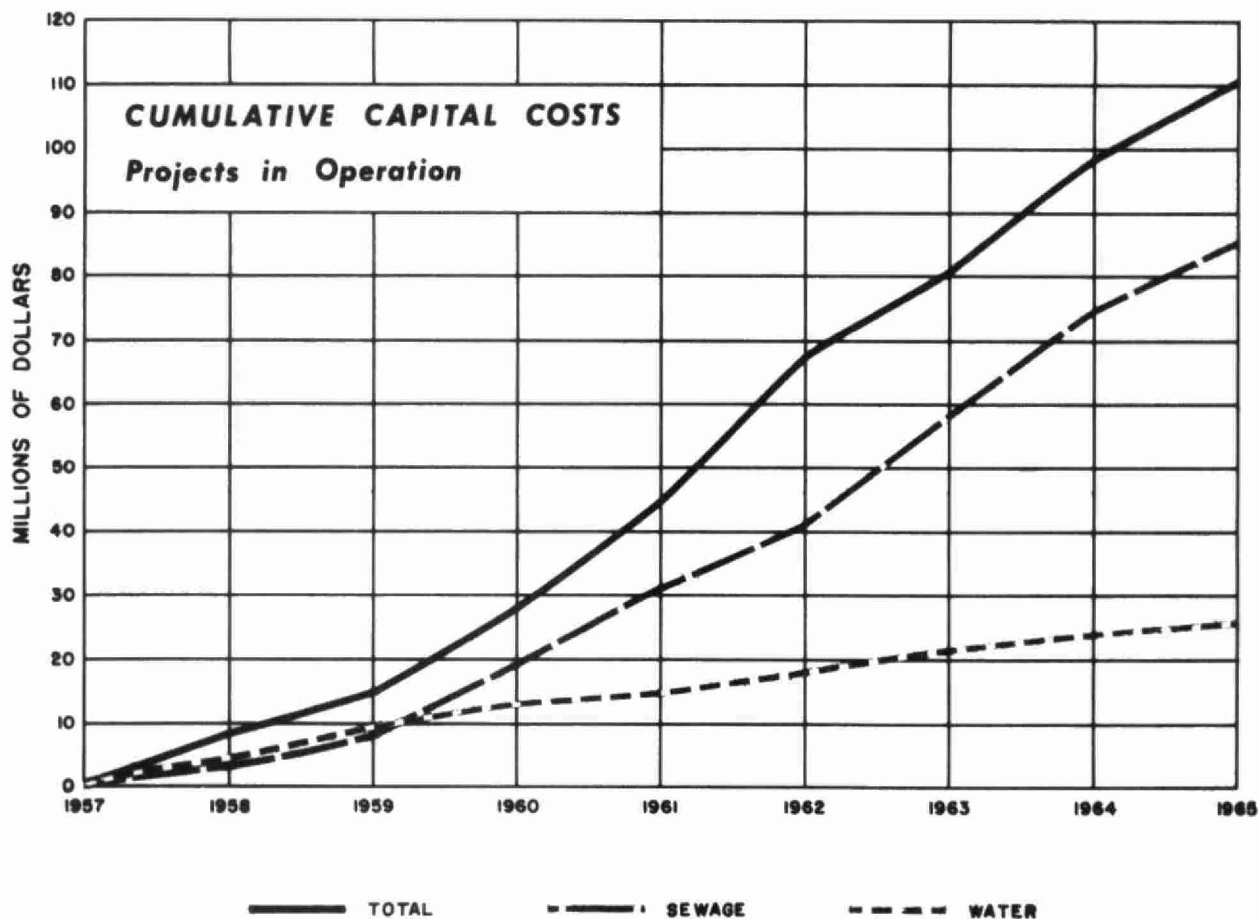
Capital value of works which came into operation in 1965.....

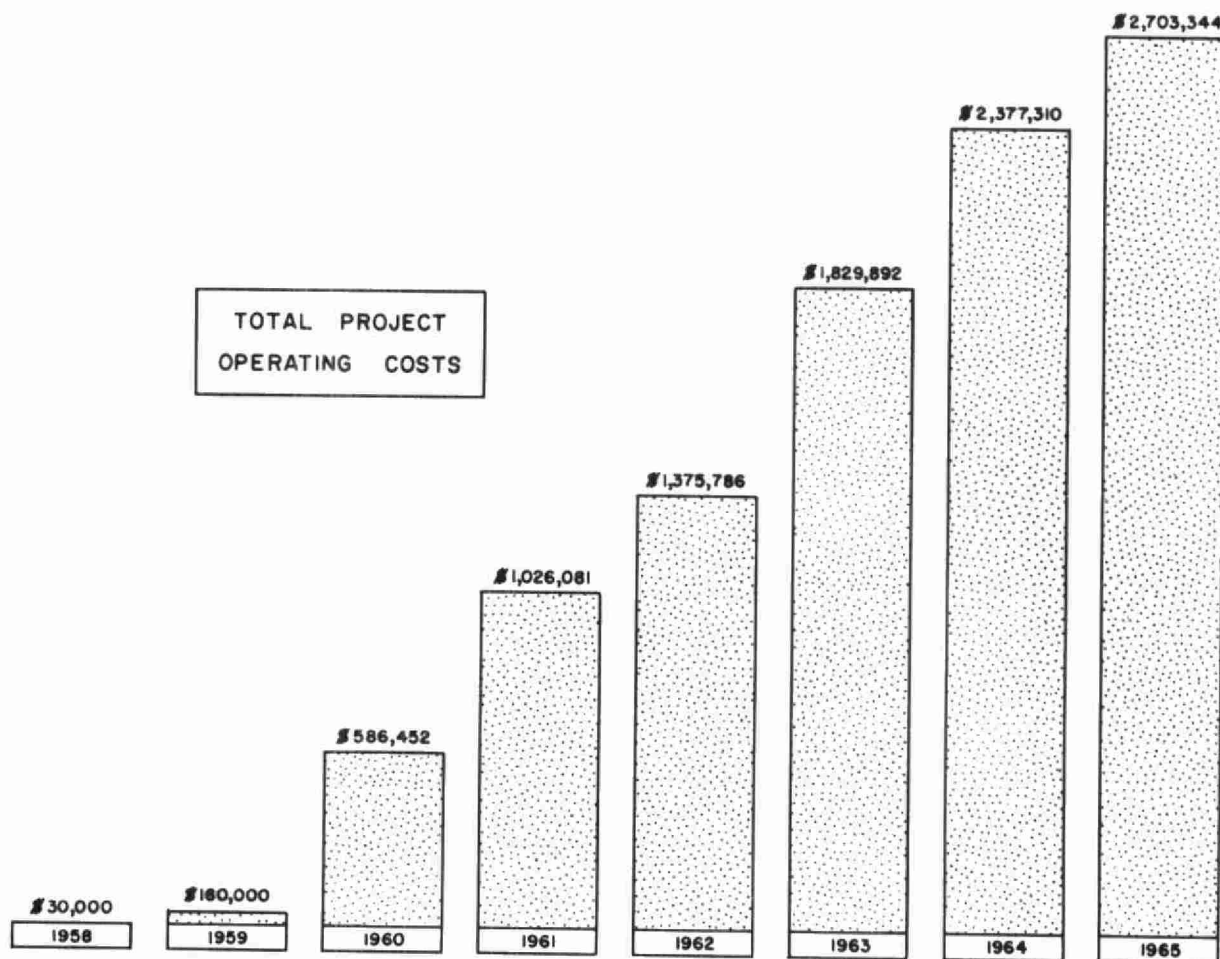
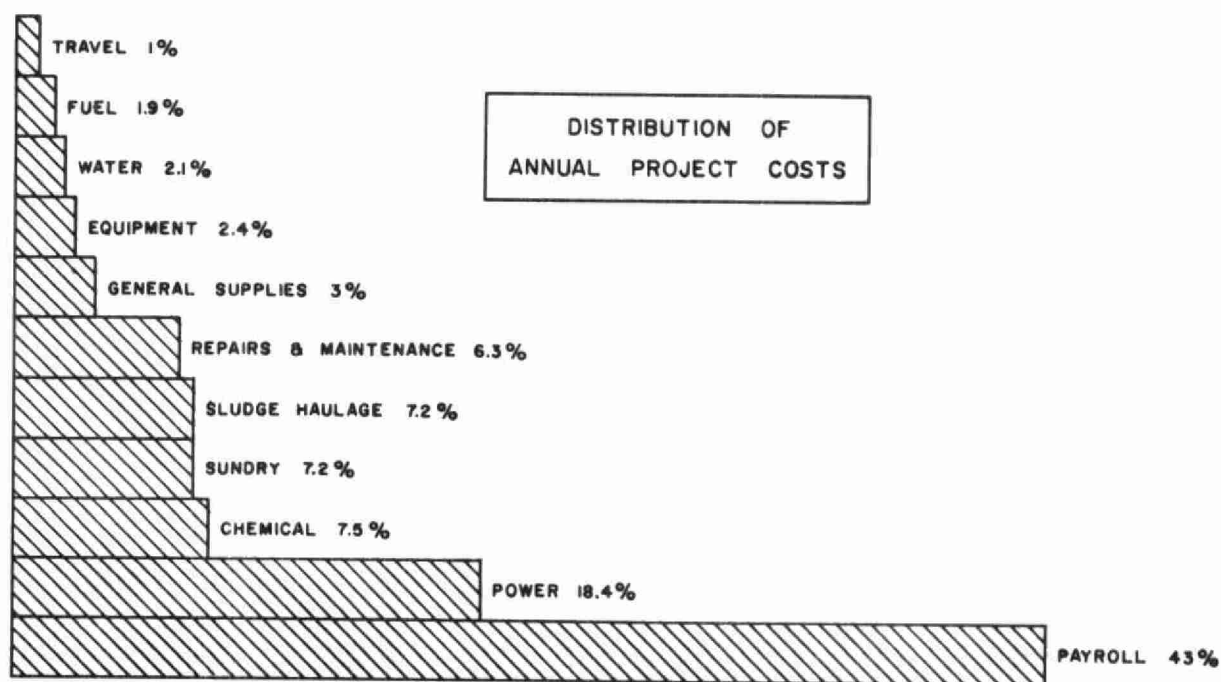
Sewage Projects	\$10,313,241
Water Projects	<u>\$ 1,813,394</u>
Total	\$ 12,126,635

b) Projects in Operation

<u>Year</u>	<u>Water</u>	<u>Sewage</u>	<u>Total</u>	<u>Increase</u>
1958	9	6	15	-
1959	21	13	34	19
1960	32	33	65	31
1961	53	58	111	46
1962	74	81	155	44
1963	85	106	191	36
1964	96	134	230	39
1965	105	150	255	25*

* There were 26 new projects started, less one termination - 60-S-58 (Chelmsford).







Plant maintenance is a continuing process.



c) Total Operating Costs of Projects --

Water	\$ 459,466.16
Sewage	\$2,246,878.08
Total	\$2,706,344.24

d) Total Operators on OWRC Payroll --

1958	15	1962	162
1959	22	1963	191
1960	92	1964	210
1961	145	1965	231

(Water systems operators - 39; Sewage plant operators - 192)

12 of these were part-time operators.

e) Total volume of sewage treated in 1965 - 39,041.530 mg

Average cost per million gallons of sewage treated	\$56.33 (16% less than 1964)
Average cost per thousand gallons of water treated	\$ 0.064 (2% more than 1964)

These amounts are for direct operating costs only.

Projects which came into operation in 1965

Water Projects

61-W-78	Twp. of Fauquier (Moonbeam)	64-W-130	Twp. of Clarke (Orono)
61-W-93	Eganville	64-W-133	Twp. of Widdifield
63-W-113	Chalk River	64-W-134	Marmora
63-W-116	Woodslee Area	64-W-136	Brampton
63-W-127	McGregor Area		

Sewage Projects

61-S-79	Twp. of Fauquier (Moonbeam)	62-S-142	Essex
61-S-96	Elmira	63-S-149	Brighton
62-S-100	Port Colborne	63-S-150	Richmond Hill
62-S-110	Kincardine	63-S-153	Rockland
62-S-113	Parry Sound	63-S-158	Twp. of Saltfleet
62-S-123	Harriston	64-S-165	Burlington
62-S-129	Wingham	64-S-169	Twp. of Moore(Corunna)
62-S-139	Wingham	64-S-172	Cornwall
	64-S-173	Fort William	

The 255 projects in operation served a total of 171 municipalities and seven industries. The following tables show the number of projects which came into operation during the year and the total number of projects in operation by the end of 1965.

	NEW PROJECTS IN 1965	TOTAL PROJECTS IN OPERATION
	<u>Sewage Facilities</u>	
Primary Treatment Plants	-	15
Secondary Treatment Plants:		
Conventional Activated Sludge	1	26
Total Oxidation	-	5
Lagoons	6	36
Sewers and Pumping Stations	10	67
Trickling Filter	-	1

	NEW PROJECTS IN 1965	TOTAL PROJECTS IN OPERATION
	<u>Water Facilities</u>	
Treatment Plants	2	22
Wells	2	25
Standpipes	-	7
Lake Intakes	-	7
Reservoirs	-	6
Mains Only	5	38

Safety Program

In accordance with new regulations of the Department of Energy and Resources Management requiring all personnel who service digester gas-fired equipment to be licenced, 81 operators and 12 head office technicians took the necessary training and were certified as gas fitters.

A new edition of the OWRC Operators' Safety Manual was prepared. This manual covers such subjects as laboratory safety, handling of chlorine, entering of digesters, maintenance and repairs in pumping stations, and electrical maintenance.

Safety lectures were given to operators taking the OWRC Water and Sewage Works Operators' Training Courses.

One hundred and twenty-seven visits were made by the Safety Officer to OWRC projects to carry out safety inspections and to give on-site safety training to plant operators.

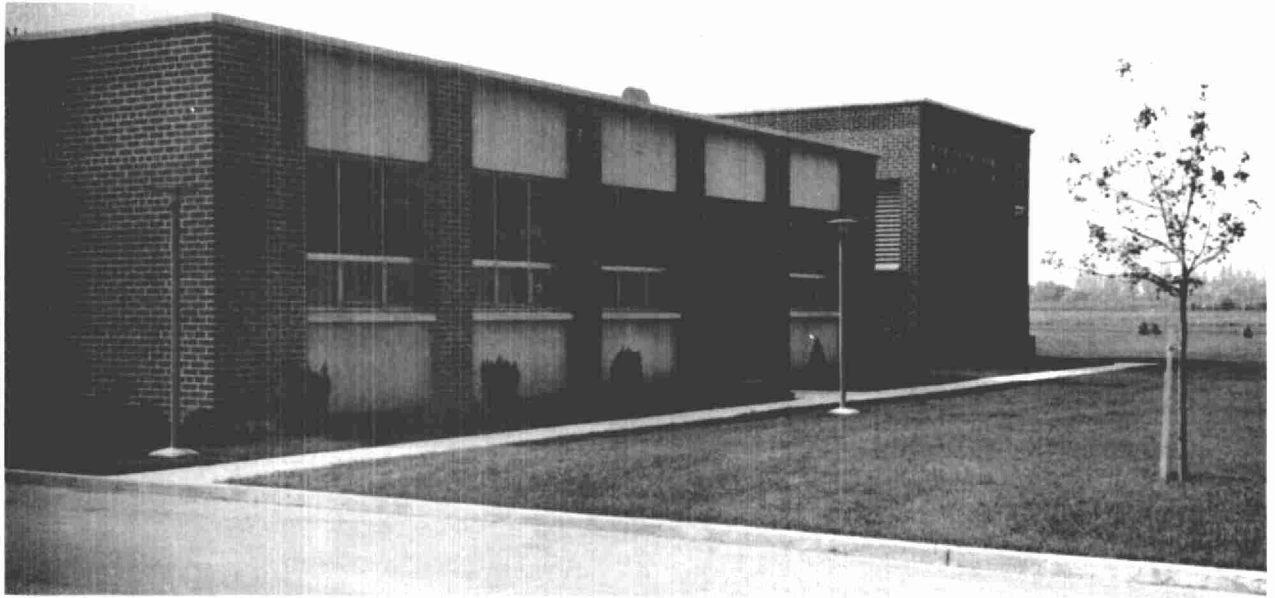
There were no fatalities or permanent injuries to any Operations staff during the year.

Winter at a water pollution control plant.

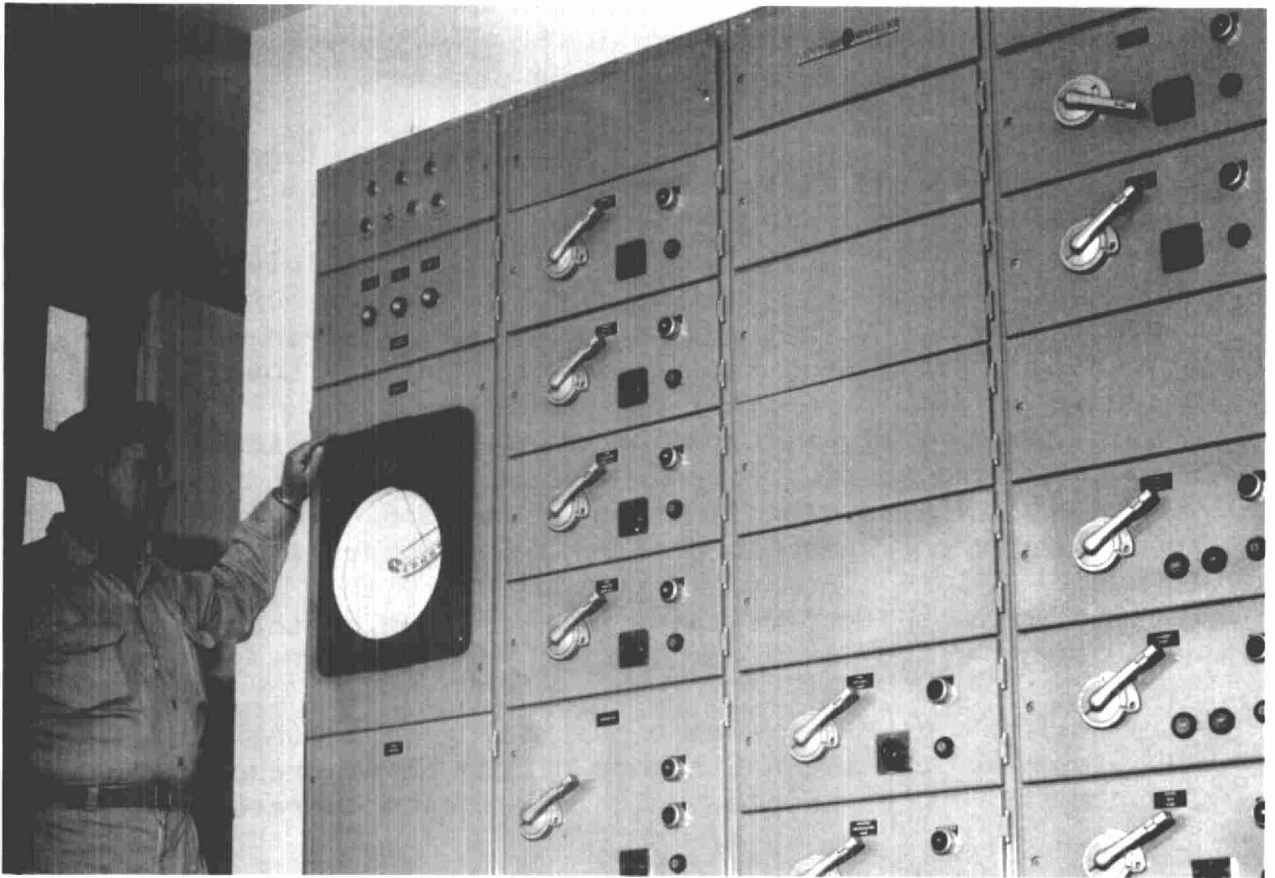


A plant duty.





Administration building of a typical water pollution control plant.



A plant operator checks his control panel.

Division of Project Development

P. G. Cockburn, Director

The year 1965 was the first complete year in which the Division operated with the two Branches, Projects and Property, the Division having been formed late in 1964. With the Commission expanding its role to include the provision of sewage and water facilities as provincially-owned projects and the implementation of regional studies for water and sewage requirements on an area basis, the workload and the function of the Division altered to incorporate these changes in policies and procedures.

In view of these changes, considerably more meetings with consulting engineers and municipal representatives have resulted in the past year to assist municipalities in developing projects.

Participation of the Municipal Development and Loan Board and the Central Mortgage and Housing Corporation in the financing of the applicable projects decreased the financial burden on municipalities due to the forgiveness feature incorporated in both types of loans. With the termination of the loan allocations from the Municipal Development and Loan Board scheduled for March 1966, there was considerably more participation of the municipalities with this form of financing in the latter part of the year. Several municipalities encountered difficulties in raising the revenue to pay the annual charges due to an insufficient number of persons using the facilities in the early stages of operation of the various projects.

During the year a form of operating agreement was prepared with the assistance of the Legal Branch. The agreement will enable the Commission to operate

certain facilities not constructed as a Commission project but where associated works have been constructed under a normal agreement with the municipality.

More details of the work carried out by the Division is contained in the following Branch reports.

PROJECTS BRANCH

During the year 33 new municipal projects were accepted by the Commission, 11 water projects and 22 sewage projects. The estimated costs of these projects was \$1,901,600 for water works and \$9,700,347 for sewage works, for a total of \$11,601,947. A list of new projects accepted during 1965 follows:

<u>Municipality</u>	<u>Description of Project</u>	<u>Estimated Cost</u>
Town of Midland	Water mains, deep well & pumhouse	\$ 82,500
Twp. of Percy (P.V. of Warkworth)	Water mains, service connections, a dam and intake, water treatment plant and ground storage tank	\$ 184,200
Village of Brighton (Ext.)	Sanitary sewers	\$ 100,099
Village of Markdale	Sanitary sewers, waste stabilization pond	\$ 273,300
Town of Rockland (Ext.)	Sanitary sewers	\$ 42,743
Village of Elmvale (Ext.)	Sanitary sewers, service connections	\$ 343,040
Twp. of Rayside	Test drilling	\$ 10,000
Town of Harriston (Ext.)	Sanitary sewers	\$ 88,710
Town of Mattawa (Ext.)	Sanitary sewers	\$ 22,005
Village of Arthur	Sanitary sewers	\$ 37,000

<u>Municipality</u>	<u>Description of Project</u>	<u>Estimated Cost</u>
Town of Brampton	Water mains, reservoir	\$ 584,400
Twp. of Clarence	Test drilling, well development, pumphouse	\$ 12,000
Twp. of Gloucester/Nepean	Two sewage, pumping stations, activated sludge sewage treatment plant	\$ 872,000
Metro Toronto/Toronto Twp. (Lakeview Ext. #2)	Extension of existing water pollution control plant	\$3,000,000
Village of Beeton	Sanitary sewers, pumping station, forcemain, waste stabilization pond	\$ 179,322
Town of Durham (Ext.)	Sanitary sewers	\$ 16,675
Town of Haileybury	Sewage pumping station, modified activated sludge treatment plant	\$ 213,500
Twp. of Saltfleet	Purchase of water system from E.D. Smith & Sons Ltd.	\$ 44,000
Village of Chesterville	Well pumping station, connecting water main	\$ 30,000
Village of Eganville (Ext.)	Water mains, service connections	\$ 85,500
Town of Grimsby	Water mains and connections	\$ 79,000
Twp. of March, Nepean & Goulbourn	Sanitary trunk sewers	\$ 470,339
Twp. of Clarke (P.V. of Orono) (Ext.)	Water mains, service connections	\$ 2,860

<u>Municipality</u>	<u>Description of Project</u>	<u>Estimated Cost</u>
Village of Dutton	Sanitary sewers, pumping station, forcemain, waste stabilization pond	\$ 234,375
Village of Glencoe	Sanitary sewers, pumping station, waste stabilization ponds	\$ 490,000
Village of Lucan (Ext.)	Sanitary sewers	\$ 22,760
Twp. of Nepean	Extension of sewage treatment plant, modification of pumping station, construction of outfall sewer and berms	\$1,875,000
Town of Richmond	Sanitary sewers, pumping station, sewage treatment plant	\$ 204,000
Twp. of Macaulay	Water main	\$ 40,000
Twp. of Neebing	Water mains, service connections, meter chambers	\$ 750,000
Village of Stirling	Sanitary sewers, pumping station	\$ 79,019
City of Waterloo	Improvement to existing sewage treatment plant	\$ 750,000
Twp. of Wilmot	Sanitary sewers, pumping station, forcemain, treatment plant	\$ 383,660
		<hr/>
		\$11,601,947

A tabulated summary of the activities of the Branch follows:

STATISTICS - PROJECT CONTROL - 1965

- 71

PROPERTY BRANCH

The year 1965 saw a reduction in this Branch's program of acquiring land for regular Commission projects due to a general decrease in volume of such projects. The trend toward projects for smaller municipalities continued throughout 1965, having the effect, in general, of reducing the amounts paid for individual sites and easements. This decrease was more than offset, however, by property acquisitions work associated with the Lake Huron Water Supply System.



Preservation of clean streams in Ontario is the objective of the OWRC.

Taxes

The Commission policy on taxation review for regular projects was unchanged during 1965. Where an assessment was approved by a municipality which was responsible for paying taxes, no further action was taken. Where requested, however, the assessment was reviewed and a report submitted to the municipality. The assessment was appealed where circumstances warranted.

The major appeal conducted during 1965 concerned the filtration plant site in the Union Water Supply System. The

matter was appealed before the Court of Revision in October; the hearing was adjourned, and the court was reconvened on December 31st. Decision of the court was awaited at the end of the year.

A review was also undertaken of Commission liability for provincially-owned projects, and discussions are continuing with the Department of Municipal Affairs.

Lake Huron Water Supply System - WP. 64-1

Most of the field work of the Branch in the first half of the year concerned the settlement of property acquisitions with respect to the above project. Additional property agents, on loan from the Department of Highways, assisted Commission staff in these negotiations.

With the commencement of construction during August, all crops on the affected section of the line were appraised and settlements reached. These payments were made within a short time of the crops being destroyed.

Lake Erie Water Supply System - WP. 65-2

Late in December, a feasibility study for this project was undertaken and a preliminary report on alternative routes and sites prepared, including a tentative estimate of property costs.

Statistics

The statistics of property acquisitions during 1965 by this Branch are as follows:

Property

Property under negotiation at end of December 31, 1964.....	67
New properties listed for acquisition during 1965.....	111
Options obtained or property otherwise acquired during 1965..	125
Properties under negotiation at December 31, 1965.....	53

Options

Options held at end of December 31, 1964.....	369
New options acquired during 1965.....	73
Deals completed during 1965.....	161
Options outstanding at December 31, 1965.....	281

General

Provincial Projects

Subsequent to the announcement of the extended activity of the Commission in the provision of water and sewage works facilities, the Division received 36 applications from municipalities for sewage works, 5 applications for water works and 6 applications for both water and sewage works. In addition, requests have been received from 27 municipalities for further information on the proposed program.

Regional Studies

A number of studies were authorized by the Commission during the year. The status of these studies at the end of the year was as follows:

(a) Lake Huron Water Supply System (Secondary Facilities)

Water supply from the Lake Huron pipeline for several municipalities along the route was studied by consulting engineers, and the interested municipalities have been asked by the Commission to undertake further engineering studies on their internal distribution systems before firm proposals are presented by the Commission.

(b) Lake Erie Water Supply System

Engineers have been authorized to proceed with the final design of a water supply system to serve the St. Thomas area.

(c) County of Peel

The report on the water supply and sewage treatment requirements for the southern part of the County was reviewed by the Commission staff. Meetings were held with municipal representatives and it was planned to present tentative proposals to the municipalities for their consideration early next year.

(d) Lower Grand Valley

A draft report on the water supply requirements for the Lower Grand Valley area from Lake Erie to Brantford was reviewed by Commission staff and the final version of the report was under preparation at the end of the year.

(e) County of Lambton

A report on water supply requirements for the western region of the County was reviewed by the Commission staff in the latter part of the year.

(f) County of Kent

An area meeting with interested municipalities was held in Chatham to present information on the engineer's report on water supply for the County.

(g) County of Lincoln

A consulting engineer has been retained to prepare a report on the sewage works requirements for the western portion of the County.

(h) Napanee/Deseronto Area

A report on the water supply requirements was received by the Commission. Further development of this study was scheduled for early 1966.

(i) Township of Bucke (North Cobalt Area)

A report on the water supply requirements was under preparation at the end of the year.

(j) District of Sudbury

As a result of interest shown in a water supply for the Sudbury area, a public meeting to receive briefs and observations from the interested municipalities and industries is scheduled for January, 1966.

(k) Townsite of Moosonee

In co-operation with the Department of Municipal Affairs, a joint study of the water and sewage requirements of the Townsite was authorized by the Commission. The report was scheduled for completion early in 1966.

(l) County of Essex

A report on water supply requirements for several regions within the County was completed during the year.

Division of Research

A. J. Harris, Director

The Division of Research is organized into three branches whose work is described as follows.

1. The Field Projects Branch establishes, and operates experimentally, a number of large-sized field pilot projects. These are usually related to advanced processes and equipment, or involve a study of water and sewage problems for which no information is apparently applicable to the Ontario environment.
2. The Technical Advisory Services Branch consists of a number of specialists in water and sewage treatment, providing technical assistance to the other divisions and to municipalities encountering out-of-the-ordinary difficulties in the processes involved in water and sewage treatment plants. This Branch operates a laboratory in such a way that technical personnel and analytical equipment may be transferred from the main building and established on short notice at the various field sites where investigations are in progress.
3. The Special Studies Branch carries out studies of a non-engineering nature associated with the problems of water resources - although in many of the problems engineering principles are involved. Example investigations are in the field of biology, microbacteriology, plant physiology, chemistry, physics, and stream ecology. They involve such procedures as the use of attenuated polio virus, radioactive tracer techniques, special culture of algae and simulative models. In view of the special or non-routine nature of many of the analytical requirements, this group operates a laboratory capable of sophisticated procedures in various fields of study.

The personnel of the Division are trained in fields which include bacteriology, biology, chemistry, civil engineering, mechanical engineering, and chemical engineering at both the scientific and technical level.

FIELD PROJECTS BRANCH

Pilot plant engineering and operations involved the major portion of the work load of this Branch in 1965. Associated with the evaluation of these units was the collection of over 3,000 samples involving 5,500 analyses by branch personnel during field investigations. Much of the analytical work was carried out at temporary laboratories set up at the pilot sites.

In the development and planning of the various projects, literature searches were another major activity. The compilation of data and preparation of reports were also necessary phases of each research project. Wherever possible, opportunity was provided for the scientific and technical staff to obtain training in advanced treatment and to become familiar with new developments in the water resources field.

Some of the activities involving the major field projects are outlined below:

Erosion Control

The investigation of wave erosion on waste stabilization pond berms was initiated in late 1964. Early phases of the study commenced with observation of field conditions and the installation of wave energy dissipators in the form of log booms and sand bags at selected test sites in the Lindsay waste stabilization ponds.

In June of 1965 the second stage of the work was begun. Investigations leading to wave height predictions on ponds and the construction of a wave tank for laboratory-controlled erosion studies were carried out.

Extrapolation of published data on ocean waves provided a theoretical correlation of wave height with wind velocity and wave fetch. This correlation was substantiated by a number of field determinations at small municipal installations.

The test programs are scheduled to continue into 1966.

Supplementary Aeration of Waste Stabilization Ponds

This project, begun in May of 1965, had the Sandwich West industrial lagoon system as its initial subject.

Approximately 85,000 gallons per day of waste, averaging 370 ppm biochemical oxygen demand, were treated in an aeration basin equipped with a 7-1/2 foot diameter Simcar Aerator and with 2-1/2 days detention. This was followed by a conventional settling lagoon of 3 months detention.

The study was designed to obtain information on this particular installation and to give general operational data on this type of aerator.

Two periods of study (one in August and one in October) employed a portable laboratory for on-site chemical analyses. A similar four week study is planned during the critical break-up season next April with periodic inspections throughout the winter season.

Active assistance was given in this work by the Sandwich West Public Utilities Commission.

Sludge Lagooning

The performance and operation of sludge thickening lagoons has been under observation at the Lakeview Water Pollution Control Plant for the past fifteen months. Three units ranging in capacity from 100,000 gal. to 600,000 gal. were provided at Lakeview for this purpose.

Sludge lagoons are basically excavated basins in which sludge can be stored until a reduction of sludge volume requiring disposal can be obtained. The low capital cost of the lagoons has led to their indiscriminate use in the past with resulting serious nuisance development.

Results of the present study, supplemented by information collected earlier at Stratford and from other sources, has assisted in establishing design and operating criteria for digested sludge thickening in lagoons.

Tertiary Treatment at Brampton

(a) Biological Treatment

The program of operation and study of the tertiary treatment ponds at Brampton, as commenced in August 1964, was maintained until mid-December of 1965. Two ponds, differing in depth and size, had been constructed at the Brampton-Chinguacousy Water Pollution Control Plant with financial

assistance from the Town of Brampton and the Township of Chinguacousy.

The purpose of this research was to explore the possibilities of using lagoons, with or without artificial aeration, to improve secondary sewage treatment plant effluents. Stabilization treatment was selected because of its potentially low capital and operating costs. Investigations indicated the need for increased removal of biochemical oxygen demand (BOD) from the treatment plant effluent.

Operation of the units included both parallel and series flow arrangements over wide ranges of flow input. The effects and performance of three different aeration systems were observed during changing seasonal conditions. The use of copper sulphate for control of algae growth was tested.

Collection of composite samples for analyses, field tests, and observations were carried out on a daily basis after each change in operating procedure.

In view of the urgent need for tertiary treatment at a number of locations within Ontario, a preliminary review of the research results was prepared as a guide to further planning in these areas.

This work has not only provided information on the performance of the respective processes, but also resulted in the development of techniques for flow measurement, composite sampling, oxygen uptake rate measurement, and continuous recording of dissolved oxygen and pH. In addition, it has highlighted the need for a study of algae growth suppression methods and the stream quality effects of algae discharge from waste stabilization ponds.

(b) Chemical Coagulant Addition

Supplementing the aeration system investigations for improving sewage treatment plant effluent was a chemical treatment study. The first phase of the study, initiated in December of 1964, and extending into April of 1965, consisted of a comprehensive series of jar tests for the removal of phosphate nutrients. During the experimental additions of coagulant chemicals, such as alum, ferric chloride, lime, and acid-activated fly ash, the removal of phosphates and related nutrients from samples of the

plant effluent was observed. Calculations, based on more than 180 laboratory and 150 field test trials, were used to estimate chemical cost curves for phosphate removal using such coagulants. The jar tests also indicated that significant improvements in effluent biochemical oxygen demand (BOD) could be realized with even minimum coagulant dosages.

As the further elimination of BOD from the treatment plant effluent was considered the most critical requirement, a pilot plant test was set up to determine if a relatively small amount of coagulant could improve the quality of the effluent from the final clarification tanks. Beginning in October, alum solution was fed into one of the four parallel treatment lines of the Brampton-Chinguacousy Water Pollution Control Plant.

Advance observations on the biological treatment receiving the alum addition, indicated a modest improvement in effluent quality relative to unsupplemented units. The apparent improvement in effluent BOD, suspended solids, turbidity, and phosphate will be studied further in 1966 to determine if the process has true economic merit.

Sewage Effluent Diffusion in Large Bodies of Fresh Water

A study into the efficacy of fresh water outfall disposal of waste has been established. The primary objective is to determine the most efficient design and location for new outfalls. Specific reference to the north shore of Lake Ontario is proposed but application will be possible to any large body of fresh water.

The project involved extensive literature reviews of all pertinent information, deep water and inshore studies, and lake current and diffusion studies.

Pleasure Boat Marine Toilet Facilities

The Division of Research joined with the divisions of Laboratories and Sanitary Engineering in the preparation of a report on marine toilet disposal facilities. A literature search was undertaken to determine the means of disposal available, and to ascertain what legislation had been passed or was being considered by the various legislative bodies in the United States and in Canada.

Other investigations by the Field Projects Branch included the measurement of sludge density, high rate filtration, the occurrence of foam in rivers, the Ever-full Lagoon system of

industrial waste treatment and an experimental river basin study which, upon development, became active under the River Basin Research Branch.

Lectures were prepared and presented at the request of the Nova Scotia Technical College in Halifax and the École Polytechnique of the University of Montreal on new developments and trends in wastewater treatment in Ontario.

TECHNICAL ADVISORY SERVICES BRANCH

One of the principal functions of this Branch is the assisting of other groups and divisions of the Commission in the solving of technical problems of a chemical nature, arising in the operation of waterworks and water pollution control plants. This assistance is not limited to Commission projects. The solution of such problems may require experimental work either in a field laboratory or in the Commission laboratory at Toronto.

The routine work load also includes the evaluation of certain equipment and processes used for water purification and/or wastewater treatment. Such an evaluation is usually made on a plant scale.

The year's activities are summarized in three main categories: (a) water purification, (b) wastewater treatment, (c) branch laboratory activities. Some miscellaneous items are collected under a general heading.

Water

A wide variety of challenging and interesting problems was investigated in water purification plants throughout the Province this year. As in previous years, one of the pressing problems requiring immediate attention was the occurrence of unusual tastes and odours in potable water supplies. A bad situation was experienced in the water supply to Sudbury. The odours in the water derived from Lake Ramsey reached a level with threshold odour numbers exceeding 400. These conditions were caused by the presence of heavy populations of a particular species of algae in the lake.

Beginning in January, the water supply in Belleville was beset by severe taste and odour conditions believed to be caused by the presence of phenols. Chlorine dioxide treatment caused some definite improvements in the palatability of the water. Later bench-scale studies were

carried out with chlorine dioxide and powdered carbon. The results showed that chlorine dioxide treatment was only partially effective in removing odours due to algae, whereas with a proper application of carbon, the odour levels could be significantly reduced.

Odour problems due to algae were also experienced at Prescott. The algal growth appeared to have resulted from pollution of the raw water source. Bench-scale tests showed a reduced odour intensity after superchlorination.

During the winter months, difficulties involving coagulation were experienced in water treatment plants at Perth and Port Rowan. At the latter plant, these problems were compounded by a lack of adequate mixing within the newly-installed clarifier.

At Dresden the treated water became unstable after lime-softening. Tests were conducted using gaseous carbon dioxide for recarbonation. This appeared to be a feasible method for stabilization of the treated water.

Some difficulties were experienced in smaller municipalities which derive their water supplies from wells. Many of these were caused by corrosion or by the presence of hydrogen sulphide in the distribution system. During the year, problems of this nature were investigated at Alliston, Elora, Caledonia, Mount Forest, and Richmond Hill. In some instances, it was possible to overcome these troubles by proper chlorination and a regular program of hydrant flushing.

One unusual assignment carried out during the year was an investigation into the effects of mixing ground water from the Brampton area with treated water from Lake Ontario. Similar studies have been initiated at London in connection with the Lake Huron Water Supply System.

An extensive survey of the Loch Garry and Garry River system was carried out with the Biology Branch to assess its suitability as a water supply for the Town of Alexandria from the standpoint of biological and chemical quality.

Pilot plant studies at the Ontario Fire College were completed. As a result of these studies, a diatomaceous earth filter was installed to purify the water supply for the College.

Requests for technical assistance in solving water treat-

ment problems were received from health authorities in other provinces such as Manitoba, New Brunswick, and Quebec.

Assistance was given to the Design Approvals Branch in providing some comments on the plans and specifications of new waterworks installations that were submitted to that Branch for approval.

During the year, technical advice on various aspects of water treatment, involving corrosion, chemical treatment, filtration and operation, has been given to consulting engineers, Commission personnel, municipal officials, and waterworks operators.

Wastewater

Again this year, considerable attention was given to the transfer of oxygen in aeration systems of wastewater treatment plants.

A coarse bubble-type air diffuser was tested at the Elora WPCP. Results showed oxygen transfer efficiencies of approximately 3 per cent. When the plant receives the design load, further tests will determine whether the aeration system will be adequate.

Similar coarse bubble air diffusers installed at the Markham Village WPCP could not supply all the required oxygen. However, adequate aeration was achieved after enlargement of the diffuser orifices and an increase of blower capacity.

Additional work was carried out at the Newmarket East Gwillimbury WPCP, with respect to the mechanical surface aerators. The test work included measurement of oxygen transfer capacity and efficiency, bottom velocity, and depth of sludge layer. A modified aerator was finally recommended.

The aerated lagoon apparently is becoming better known as a method of wastewater treatment in Ontario. During the year, sampling surveys were conducted at three installations of this type, to determine the loading and treatment efficiency. Near Trenton a small aerated lagoon treating domestic wastewater did not show beneficial effects of the supplemental aeration because of the very low loadings. Two aerated lagoons, treating industrial wastes near Alliston and Kettleby, have been kept under close surveillance, particularly during the winter months

to determine the effects of cold weather on treatment efficiency and performance.

Special assistance was given to the Division of Plant Operations in the solving of operating problems at the Elmira WPCP, these being related to several industrial wastes being discharged to the plant. On the basis of bench-scale test results an operating procedure was recommended for recovery of the treatment process after a shockload or plant upset.

Two projects were conducted for the evaluation of sewage treatment equipment. At the Orangeville WPCP several composite sampling programs were carried out to determine the performance of a peripheral feed primary clarifier. At Picton the contact stabilization process of the wastewater treatment plant was investigated and found to be functioning satisfactorily at approximately 75 per cent design load. The final effluent was generally acceptable.

To obtain additional information on the operation of the oxidation ditch, the installation at Glenwood, Minnesota, was visited. With the necessary precautions, winter operation was essentially trouble-free. Operating records showed satisfactory treatment efficiencies.

Laboratory Section

A number of new dissolved oxygen meters were evaluated because of their importance to the oxygen transfer program. The experience of previous years was again confirmed that much time is required to maintain dissolved oxygen meters in proper calibration, and that only a qualified laboratory technician should operate a DO meter to obtain satisfactory results. A membrane type DO probe, recently developed in England, showed superior results, mainly because of its large electrode surface area and the resulting high current output.

A chemical dissolved oxygen kit, specially designed for field use, was tested and was found quite useful for Commission field staff. The kit employs the Winkler method; most of the reagents are in powdered form.

A method was developed for measuring the oxygen content of the exit gas from a diffused aeration tank using a gas partitioner. The efficiency of oxygen transfer from the diffused air was calculated. Preliminary field tests of this method at the Elora WPCP showed encouraging results.

A pilot-size vortexing aerator was tested in the aeration test tank. The main object was to determine the circulation capacity of the aerator. An auxiliary impeller was required to maintain adequate liquid velocities near the tank bottom. A concentration of 1 mg/l ABS reduced the measured velocities by about 10 per cent.

The determinations performed in the laboratory include analytical work on laboratory experiments as well as analyses on the samples received. These samples generally required special attention because they were collected as part of branch field projects.

General

Members of the engineering staff made good use of available opportunities to advance their technical knowledge by attending several training courses. Two members of staff presented papers at the twelfth Ontario Industrial Waste Conference. A paper was also presented at a Wastewater Treatment Symposium at the École Polytechnique in Montreal on the oxidation ditch sewage treatment process.

SPECIAL STUDIES BRANCH

During the early months of 1965 personnel were mainly involved in carrying out an extensive review of literature in preparation for future research and in acquiring laboratory equipment. In late spring, when laboratory facilities became available, the following studies, with the exception of the continuing Cladophora study, were initiated: (Because of the background of the personnel these investigations were related solely to problems in water ecology research).

Lagoon Degradation Studies

In late 1964 unsupported statements were publicized which considered an oxidation lagoon waste treatment system to be incapable of reducing or removing pathogenic viruses present in raw sewage. As a result, numerous inquiries were directed to the Commission by municipalities. As no previous studies on this subject had been carried out, and in view of the large number of installations in Ontario, a program to investigate the degradation of polio virus was undertaken.

A model oxidation lagoon was set up in the laboratory,

and was fed a mixture of domestic raw sewage and attenuated poliomyelitis virus daily for 20 weeks. Virus levels in the lagoon influent and effluent were determined at regular intervals indicating a reduction in biochemical oxygen demand of more than 90%, and fecal coliform and fecal streptococci reductions exceeding 99%. These results suggested that the system was operating in a manner comparable to a municipal waste stabilization pond. Virus determinations showed that throughout the experiment no poliomyelitis virus passed from the lagoon.

Further experiments to determine the reduction of the virus in suspensions obtained from municipal lagoons are in progress.

The results of this study suggest that the poliomyelitis virus present in raw sewage will either not pass through, or will be reduced at least 10,000 fold, in a waste stabilization pond operated satisfactorily.

Algal Productivity Studies

The conversion of soluble carbonates to organic matter by algae is the first step in the food chain of natural surface waters. To study the relationship between the amount of productivity and the algal population, density investigations were conducted in two lakes, Quirke and Dunlop, in the Elliot Lake region by personnel of this section and the Biology Branch.

Experimental runs were carried out in June, August, and October. Algal productivity was estimated in situ by determining the amount of radioactive sodium carbonate incorporated by the algae present in samples of lake water. Radioactive data were obtained by counting the samples at the Radiation Laboratory, Ontario Department of Health. Lake samples for algal enumeration and chemical analysis were also obtained.

A report on the results of this study is now in preparation.

Cladophora Investigations

Studies related to algae Cladophora were constrained somewhat in 1965. All of the algicides that had shown promise in controlling Cladophora in laboratory screening tests had been tested in Lake Ontario and Lake Erie in previous years. Mechanical methods of algae removal had been thoroughly investigated in 1963 and 1964. Problems caused by excessive

growths of submergent aquatic vegetation in the Kawartha Lakes and other inland waters necessitated comprehensive herbicide evaluation studies in these areas. Nonetheless, investigations continued along several lines, even though the production of Cladophora was relatively light during 1965, and these interfered with the completion of a portion of the intended program.

(a) Evaluation of Algicidal Chemicals

An early decision was made to evaluate the most promising algicide, on larger plots than had been treated heretofore, in co-operation with agencies beset by algae problems so that they could become familiar with control operations. Arrangements were completed with the Supervisor of Parks for the Department of Lands and Forests at Lindsay, Ontario, to undertake a control experiment, 20 acres in size in Lake Ontario, off Presqu'ile Provincial Park. Similarly, a control program was established co-operatively with the Field Officer of the Niagara Conservation Authority, involving treatment of an area in Lake Erie fronting on Long Beach Park. The Lake Ontario project was nullified by the limited nature and scattered pattern of development of the algae, and the decision was made not to apply chemicals late in the growing season when little would be learned about the permanency of control. The chemical was reserved for another attempt in the 1966 growing season. In Lake Erie, immediately following application of the algicide, stormy weather developed that swept the algae off the beds of growth and carried it ashore so that observations following treatment were impossible. These situations highlight the difficulties that were experienced in chemical evaluation work in large bodies of water such as the Great Lakes.

Nine chemicals were screened in the laboratory for algicidal activity against Cladophora, only one of which demonstrated any significant promise in controlling the algae.

(b) Calculation of Areas of Growth and Surveillance Efforts

Photos from aerial surveys were employed to delineate beds of growth within a 10 foot contour along the Lake Ontario shoreline from Toronto to Burlington, and the Lake Erie shoreline from Fort Erie to Port Maitland. The total area of growth estimated for the former section of shoreline is 2,292 acres, and for the latter, slightly in excess of 5,000 acres.

Surveillance runs by boat and car were completed to provide a comparison of accumulations of algae with other years. These surveys substantiated the relatively light production of algae in the 1965 season attributed mainly to the prolonged cool, cloudy weather during spring and early summer.

(c) Additional Measures

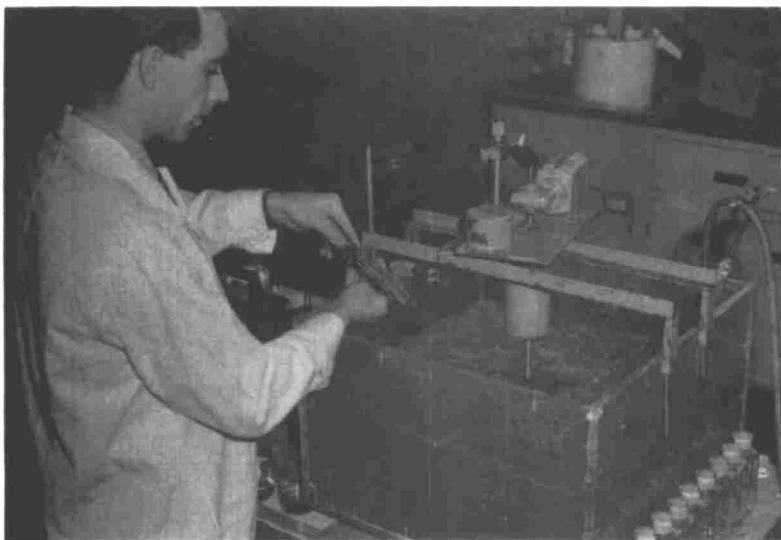
Information and advice were offered to those commercial firms who indicated a desire to contract for algae control with municipalities and other interested agencies. It is anticipated that there will be some activity in the promotion of control measures during 1966.

Studies continued on phosphorus nutrient in streams in the area north of Metropolitan Toronto. Phosphorus levels were correlated with varying volumes of flow and comparisons were made between streams flowing through urbanized and agricultural areas. A paper outlining this study was under preparation for presentation at the Great Lakes Research Conference early in 1966.

General

During the past year personnel presented papers at the following functions:- annual meeting, Canadian Society of Plant Physiologists, Fredericton, N.B.; a seminar on Biological Waste Treatment at New York, N.Y.; a symposium on the Transmission of Viruses in Water at the USPHA, Cincinnati, Ohio.

Future investigations on algal research by present personnel will include a continuation of current projects and the initiation of others, including the effects of lagoon effluent on receiving streams and the study of undesirable tastes in municipal water supplies caused by algae.



Research projects are varied
and, in some cases, unusual.



Division of Sanitary Engineering

J. R. Barr, Director
G. R. Trewin, Assistant Director

The programs of the Division of Sanitary Engineering are divided into four main categories: (1) the evaluation of plans of proposed water supply and wastewater treatment installations, (2) the inspection and supervision of water and wastewater treatment plants in the Province, (3) the study and control of pollution in the waterways of Ontario, and (4) the supervision of plumbing. In 1965, staff participated also in the review of regional studies for provincial water and sewage works projects. During the summer, a new program designed to monitor the water quality in the Great Lakes boundary waters was commenced. This new program was being developed in co-operation with the International Joint Commission and the Federal Government.

DISTRICT ENGINEERS BRANCH

General

The field work continued to be carried out under the supervision of four district engineers, each of whom covered designated areas in southern and northern Ontario. In this work, inspections were made in every part of the Province. The routine work involved stream and pollution surveys and inspections of industrial waste disposal at canning factories, milk plants, gravel washing and meat plants, as well as the inspection of water works and sewage treatment plants throughout the Province.

Water Works Inspections

There were 1,376 routine and special inspections made by the district staff of water treatment plants. This can be compared with a total of 1,068 for 1964. Some 2,257 bacterial, and 1,739 chemical samples were secured during the water works inspections.

The number of recorded water works inspection points increased from 567 in 1962 to 799 in 1965, indicating the need for an increased number of inspections each year. The yearly inspection program covered the following water works: chlorinated municipal, year-round-private and industrial (including mines) with townsites, systems not requiring disinfection, as well as summer-private and industrial (including mines) not having townsites. During 1965, 1,189 inspections were made of the routine inspection points.

Wastewater Treatment Works

There were 2,083 regular and special inspections made during 1965 of wastewater treatment works serving municipalities and industry. The number of inspections may be compared with the 1,248 inspections made in 1962. A total of 1,163 bacterial and 2,624 chemical samples were obtained while making these inspections.

The inspection objective for wastewater treatment facilities was three visits a year for secondary municipal sewage treatment plants, one inspection for septic tank facilities, with two inspections per year for industrial wastewater treatment installations and primary municipal sewage treatment plants.

(i) Sewage Treatment Plants and Septic Tank Installations

There were 595 routine inspections of sewage treatment plants and septic tank systems. The number of inspection points has steadily increased from 328 in 1962 to 425 in 1965.

(ii) Canneries

There were 130 inspections made of canneries where the objective is two inspections per year. The number of canneries in operation decreased from 82 in 1962 to 74 in 1965.

(iii) Milk Plants

During 1964, 484 inspections were made of the treatment facilities serving 287 milk plants compared with 225 inspections in 1962. The number of plants decreased from 376 in 1964 to 287 in 1965, indicating a continuing trend in the industry toward consolidation.

(iv) Meat Plants

Three hundred and thirty inspection were made of the wastewater treatment facilities serving 222 meat processing plants. This may be compared with the 76 inspections which were made in 1962.

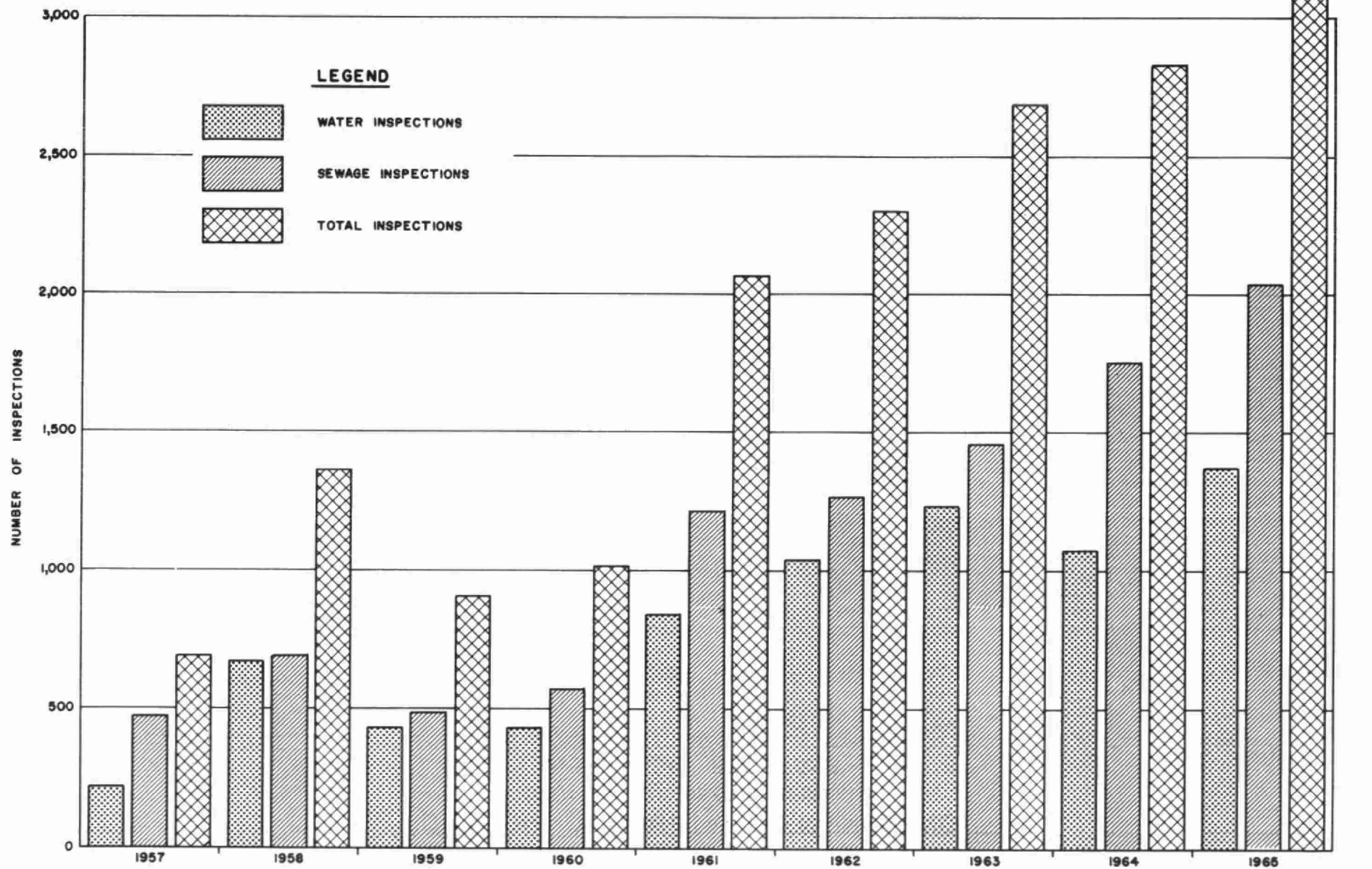


Staff conduct a dissolved oxygen test.



Above, staff discuss design specifications for a proposed project. At left, stream sampling is carried out.

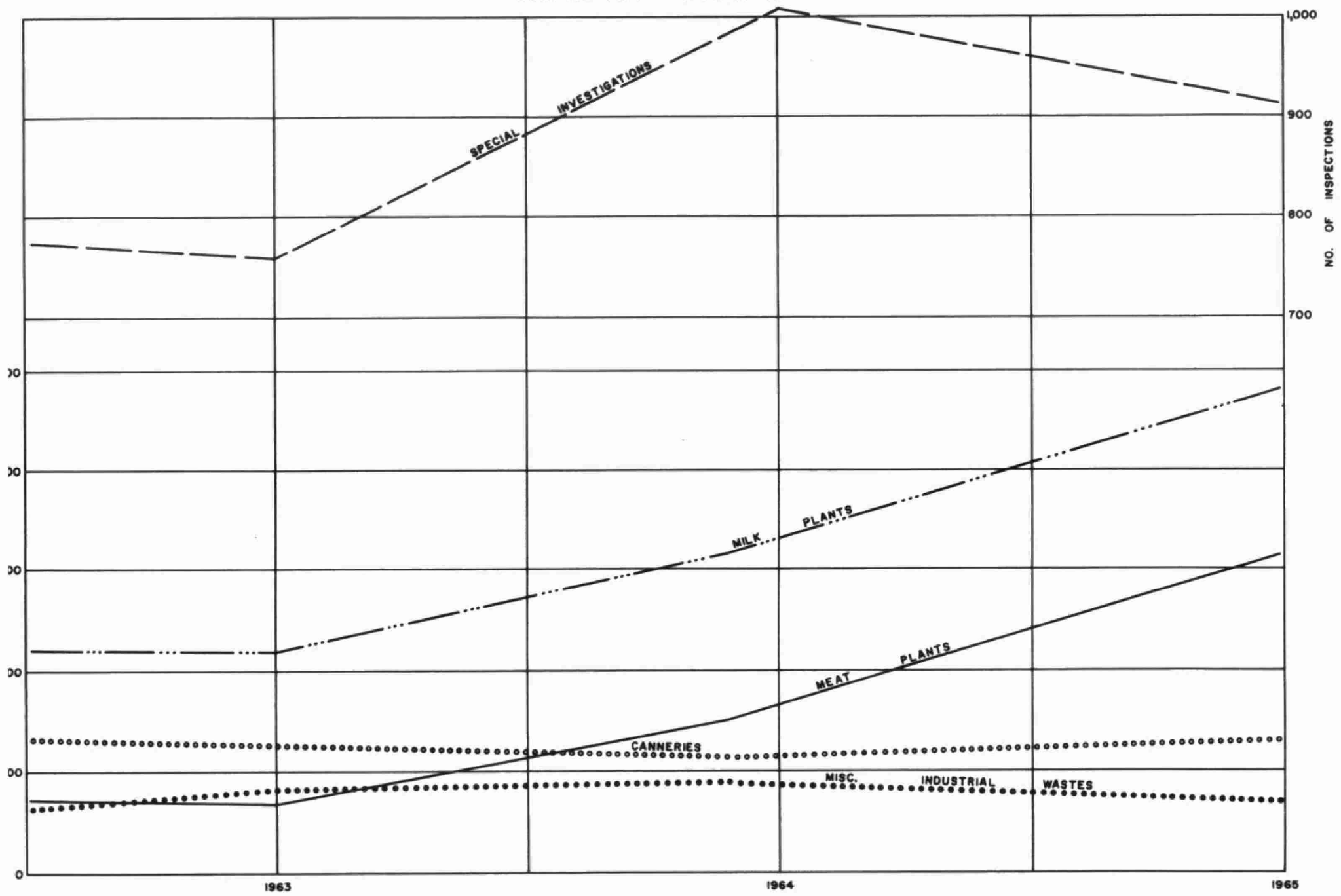
DIVISION OF SANITARY ENGINEERING
DISTRICT ENGINEERS BRANCH
INSPECTION PROGRAMS
WATER AND SEWAGE 1957 - 1965



DIVISION OF SANITARY ENGINEERING

DISTRICT ENGINEERS BRANCH

INSPECTION PROGRAMS



Prosecutions

This year directives were sent out from the Commission quoting Section 27(1) of The Act and requesting action in abatement of pollution from industrial sources. Together with the successful prosecution of some offenders, this has had the result of improved co-operation and attitude on the part of the industries concerned.

Under Section 27(1) of The Act, the District Engineers Branch instigated prosecution against a firm in the Township of Hamilton which had allowed a stream to be polluted, with the resulting death of trout. This prosecution was successful, resulting in a conviction.

Under Sections 30(1) and 31(1) of The Act, a development firm in the Township of Markham was prosecuted for proceeding to install water works and sewage works without prior acquisition of approval by the Commission.

Under Section 27(1) of The Act, legal action is proceeding against an offender in the Township of Richmond who is accused of polluting nearby wells by discharges of saline waters.

Meetings with Municipal Officials

The staff of the District Engineers Branch continued to have more direct contact with water works and sewage works officials and personnel throughout the Province. During 1965, there were 12 meetings with public utilities commissions and 78 with municipal councils. In addition, discussions were held with various municipal officials and were duly recorded. In this field, there were 550 discussions with municipal clerks, 514 with various other municipal officials, 313 with public utilities commission staffs, 87 with consulting engineers, 906 with health officials and 373 with other bodies. This is an important aspect of the activities of the Division as it brings about a direct contact between local officials and the Commission.

Special Investigations

Special investigations requested by municipalities, the public, or senior staff of the Commission contribute largely to the work of the Division. During 1965, 911 requests were received and a total of 902 were completed.

WATER QUALITY SURVEYS BRANCH

The Water Quality Surveys Branch was responsible for engineering surveys in the water quality management program in Ontario. Survey projects and continuing management programs included the following:

- (1) water pollution surveys;
- (2) river basin surveys, including water quality monitoring and wastewater assimilation surveys;
- (3) Great Lakes survey.

In addition to the above, the Branch provided draughting services for the Commission and supervision for the county survey, pollution enforcement and sewage works development programs in the Province.

Reports prepared on sources of water pollution were submitted to municipalities and industries. Ninety-eight surveys were undertaken and reports were distributed to municipalities, industries, conservation authorities, consulting engineers and others. These reports served as the basis for initiation of meetings with municipalities and others responsible for pollution and the development of control programs. This information was complemented by that obtained from the detailed investigation and survey programs carried out on provincial lakes and rivers.

Expansion of the River Basin Surveys

The Water Quality Surveys Branch expanded during 1965 to include developments in the following programs:

- (i) water quality monitoring;
- (ii) wastewater assimilation investigations.

The water quality monitoring program incorporated the regular gathering of quality information at selected locations across the Province. Data were gathered for the water supply and pollution control planning functions of the Commission, as well as for public and other demands for this information. During 1965, 210 stations were sampled an average of seven times and examined for 14 parameters of water quality. Although the major portion of this work was carried out by staff, co-operative arrangements were developed with many conservation authorities and health agencies to supplement the basic program.

Sampling programs arranged during 1964 with the conservation authorities on the Maitland and Moira Rivers were

continued during 1965. Additional programs were arranged with the Cataraqui Region Authority, Credit Valley Conservation Authority, Halton Region Conservation Authority, Holland Valley Conservation Authority, Lakehead Region Conservation Authority, Metropolitan Toronto and Region Conservation Authority, North Grey Conservation Authority, and Otonabee Region Conservation Authority. All samples taken by the conservation authorities were analyzed at the Commission Laboratory.

Regular sampling was also carried out by the Corporation of the City of London on the Thames River and by the Metropolitan Toronto Department of Works on the Don River within these respective jurisdictions.

The wastewater assimilation projects are designed to investigate natural purification processes in streams and lakes and the quality variations that result from the introduction of controlled waste loadings to watercourses. Mathematical analysis of the quality problem under various conditions of waste load and temperature is performed to provide prediction of quality relationships under future conditions.

During 1965, six wastewater assimilation studies were commenced on the Don River below Richmond Hill, the Speed River below Guelph, the Thames River below London, the Thames River below Glencoe, the Credit River below Orangeville and the Maitland River below Listowel. Three reports of investigations started in 1964 were published during the year.

Six special investigations were made, consisting of the effects on the St. Lawrence River of industrial wastewaters discharged by Courtauld's (Canada) Ltd. at Cornwall, the Kaministiquia River in relation to the Great Lakes Paper Company Ltd. (Fort William), phosphorus levels of six Metro area streams, lake and river sediment studies at Elliot Lake, phenol and bacteriological examination of the Niagara River.

Great Lakes Survey

Sampling on the western basin of Lake Erie, with the use of a small boat, was commenced on August 3rd and progressed until December 22nd when the sampling program was terminated for the year. In the course of the development of the program, two 50-foot vessels were chartered, one to continue with the work on Lake Erie and the other to resume the studies on the St. Clair and Detroit Rivers which had commenced in May of 1965. A temporary laboratory was established at the Union Water Filtration plant for analysis of the samples collected.

The program was initiated this year as part of the Commission's pollution control and water quality investigations and received a great deal of impetus as a result of the pollution reference from the International Joint Commission. In the next few months, the data collected on the survey to date will be evaluated and reports prepared. Plans to extend the investigation into lakes Erie and Ontario are being developed by a special staff of engineers and scientists to enable an early start on the work when the shipping season opens.

An important aspect of the Great Lakes investigation involved the development of an aerial surveillance program. The first aerial patrol on the St. Clair and Detroit Rivers was made in November using a light aeroplane. Plans to continue these patrols in other areas along the Great Lakes were made. Where possible, the patrols included the use of a surface water surveillance craft and when instances of pollution were sighted samples of the offending wastes were obtained for further action. It is expected that this work, in conjunction with the water-based surveys, will add an important element of strength to the pollution control program.

County Survey Program

Water resource surveys in the counties of Frontenac and Halton were published by the Branch during the year. In addition, a start was made on a survey in Waterloo County.

These studies review existing water supply and pollution control facilities and the adequacy of the works to meet future needs. The quality of surface waters and, to some extent, ground waters, was evaluated to determine the necessary protection works.

DESIGN APPROVALS BRANCH

This Branch evaluated engineering reports, plans and specifications submitted for the approval of water works, sewage works, and certain industrial waste treatment installations in accordance with Section 30 and Section 31 of the OWRC Act.

The Branch also reviewed and made recommendations to the Ontario Department of Municipal Affairs on water works and sewage works requirements for subdivision draft plans and official plans submitted in accordance with Section 26 and Section 12 of The Planning Act.

The statistical section recorded chemical and bacteriological analyses results submitted by the OWRC and the Ontario Department of Health Laboratories. Data were prepared on sewage works and water works construction costs and sewage treatment process operating results. Also, typical waste stabilization pond detail drawings were prepared to assist in the design and construction of satisfactory pond systems.

Sewage Works and Water Works Construction Costs

In response to various requests and to facilitate sewage works feasibility studies, the Branch prepared a file on sewage works construction costs with information obtained from OWRC application forms and OWRC contract prices.

The file on water works construction costs prepared in 1964 was expanded to include costs for well supply pumphouses, with and without treatment.

Certificates of Approval

In 1965, Certificates of Approval were issued for 1,753 proposed water works, sewage works and industrial waste facilities at a total estimated cost of \$140,445,691.73. This compared with 1,668 Certificates in 1964 at a total estimated expenditure of \$134,634,078.33.

Certificates issued for water works installations totalled 721 and involved an estimated expenditure of \$44,526,956.69, compared with 727 Certificates and an expenditure of \$54,961,748.83 for 1964.

In the wastewater field, 1,032 Certificates were issued during the year at an estimated cost of \$95,918,735.04, against 941 approvals in 1964 at an estimated cost of \$79,672,329.50.

Of the total Certificates issued in 1965, 23 were for OWRC water works projects and 49 were for OWRC sewage works projects. Estimated costs of the projects were \$1,562,655.50 for water works and \$5,513,012.91 for sewage works.

PLUMBING BRANCH

There were no major changes in the organization or objectives of the Plumbing Branch in 1965.

A cardex file was set up with pertinent information on the status of plumbing inspection in the Province. The plumbing inspectors' zone meetings were all attended. Meetings were held in five of the eight zones in the Province. In one instance, two zones attended a combined meeting.

Amendments to the Plumbing Regulation are now in the final stages of completion. The first draft produced by the Legal Branch has been reviewed by the Technical Committee on Plumbing and returning to the Legal Branch for final action.

Special meetings with municipal officials on plumbing matters, with manufacturers in respect to product design and development, with Canadian Standards Assoc. in respect to the testing and standardizing of materials, and with plumbing groups for the purpose of code interpretation were attended.

WATER AND SEWAGE WORKS OPERATORS COURSES

Senior and basic courses for water works operators were held during the year with attendance of 75 and 86 operators, respectively. Certificates of qualification were issued to the successful candidates completing the three courses of instruction.

There were two course of instruction for sewage works operators with 122 operators attending the basic school and 106 operators at the intermediate course.

Since the inception of the training courses for water and sewage works operators, certificates of qualification have been granted to 186 sewage works operators and 194 water works operators.



Samples being gathered
by members of the Great
Lakes' survey team.





Sampling procedures in connection with the Great Lakes' survey,



SUMMARY OF WATER AND SEWAGE WORKS APPROVALS

<u>Water Works</u>	<u>Estimated Cost</u>
Extensions to existing systems.....	\$34,304,337.66
Supply and purification.....	6,350,330.50
New Systems.....	2,872,288.53
	<hr/>
	\$44,526,956.69
 <u>Sewage Works</u>	 <u>Estimated Cost.</u>
Extensions to existing systems.....	\$83,472,504.65
Treatment and disposal works.....	9,570,794.51
New Systems.....	2,690,804.86
Industrial wastes.....	184,631.02
	<hr/>
TOTAL	\$95,918,735.04
GRAND TOTAL	\$140,445,691.73

Details of Certificates for water and sewage works
issued in 1965 follow:

CERTIFICATES ISSUED RE WATER WORKS FOR THE YEAR 1965

MUNICIPALITY	No. of Certi- ficates	Extensions to existing systems	Supply and Purification	New Systems
Acton	1	28,500.00		
Alexandria	3	54,526.00	12,240.00	
Alfred	1	1,687.50		
<u>Ancaster Twp.</u>				
(Dundana Homes Ltd., Hamilton).....	1	38,044.60		
Anderdon Twp.	1	104,454.00		
Anson, Hindon & Minden	1	660.00		
Arnprior	2	12,362.49	+635,950.00	
<u>Ashfield Twp.</u>				
(Port Albert Develop- ments Ltd.).....	1	500.00		
Atikokan Twp.	1	7,500.00		
Aylmer	1	6,120.00		
Barrie	4	98,135.60		
<u>Barrie</u>				
(Bardevco Ltd.).....	2	29,880.50		
(Barrie Industrial Assistance Co.).....	1	5,739.20		
Belle River	1	2,400.00		
Belleville	4	30,600.00		
<u>Belleville</u>				
(Mr. C. Lambert).....	1	5,401.00		
(Mapleview Realty Limited).....	1	12,736.40		
(Barkel Developments Limited).....	1	43,479.00		
(J.L. Farrell & J. Gaj- dicar & Son Ltd.)...	1	8,702.00		
Belmont	1	2,708.00		
Bertie Twp.	2	216,170.00		
Blenheim	2	12,950.00		
Blind River	1		3,450.00	
Bowmanville	1	13,200.00		
Bracebridge	2	200,000.00	+400,000.00	
Brampton	4	138,386.95		
x-Brampton	1	189,098.00	123,702.00	
x-Brampton	1	+584,400.00		
<u>Brampton</u>				
(Rubin Corporation Ltd.)	1	24,574.00		
(Peel Village Develop- ments Limited).....	1	51,519.00		

WATER WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to existing systems	Supply and Purification	New Systems
Brantford	7	254,441.57		
Brantford Twp.	2	17,000.00	17,000.00	
Brockville	4	25,600.00		
<u>Brockville</u> (Ontario Housing Corporation).....	1	169,620.00		
<u>Brougham Twp.</u> (H.E.P.C.).....	1		40,000.00	
Burlington	16	412,875.91		
<u>Burlington</u> (Woodland Estates)...	1	66,209.50		
(George Porteous & Son Builders).....	1	5,290.00		
(R.A Garside Construc- tion Ltd.).....	1	7,240.00		
Campbellford	2	2,890.00	18,000.00	
Carleton Place	1	12,654.00		
Chatham	8	149,778.40		
Chelmsford	1		800.00	
x-Chesterville	1		+30,000.00	
Chinguacousy Twp.	1	145,200.00		
x-Clarence Twp.	1		+12,000.00	
x-Clarke Twp. (P.V. of Orono)	2			182,860.00
Clinton Twp. (P.V. of Vineland).....	2	2,567.00		
Cobourg	1	30,256.65		
<u>Cobourg</u> (Kamil Developments Ltd., Oshawa).....	1	6,679.00		
Cochrane	1	80,200.00		
Coldwater	1		22,858.00	
Collingwood	3	364,700.00		
Collingwood Twp.	1		8,000.00	
Cornwall	11	104,304.56		
Cornwall Twp.	2	157,684.59		
Deep River	1		72,000.00	
<u>Dereham Twp.</u> (Mr. F.E. Scott, Tillsonburg).....	1	7,705.00		

WATER WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to existing systems	Supply and Purification	New Systems
Dover Twp. (community of Pain Court)	1		6,300.00	
Dryden	1	20,818.53		
Dumfries S. Twp. (P.V. of St. George).....	1	2,000.00		
Dundas	2	31,404.70		
Dundas (Monarch Construction Co., Toronto).....	1	85,500.00		
x-Eganville	1	+85,500.00		
x-Emo Twp.	1			+199,000.00
Ernestown Twp. (B.P. Canada Ltd., Montreal).....	1		10,500.00	
(Amherst Associates)...	1	29,360.65		
x-Essex	1	16,000.00		
(Union Water System)				
Etobicoke Twp.	20	252,752.87		
Euphrasia Twp. (Kimberley Water Works)	1	2,968.00		
Exeter	4	32,890.14		
Fauquier Twp.	1	870.00		
Fenelon Falls	3	6,745.68		
Fergus	1	25,970.00		
Ferris West Twp.	2	170,430.00		
Fonthill	1		32,084.00	
Forest	1		25,000.00	
Fort Erie	1	9,000.00		
Fort Frances	1	74,000.00		
Fort William	1	110,000.00		
Fredericksburgh N. Twp.	1	28,267.00		
Galt	3	67,717.20		
Gananoque	1		108,000.00	
Georgetown	2	220,000.00		
Georgina Twp.	2	41,068.37		
Geraldton	1	1,380.00		
Glencoe	2	34,336.00	5,664.00	
Gloucester Twp.	2	969,989.59		

WATER WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to existing Systems	Supply and Purification	New Systems
Gosfield N. Twp.	3	11,985.00		
Gosfield South Twp.	1	3,946.00		
Grand Bend	1	23,700.00		
Grimsby	2	86,200.00		
Grimsby N. Twp.	3	372,952.15		
Guelph	1	367,000.00		
Gwillimbury E. Twp.	1		22,000.00	
Hamilton	28	1,258,216.30	2,000,000.00	
Harwich Twp.				
(Mr. J. M. Shuster)...	1			20,650.00
Havelock	1		18,400.00	
Hay Twp.				
(Mr. Victor Brisson)...	1	1,040.00		
Hearst	3	98,300.00	112,000.00	
Hespeler	4	28,873.00		
Ingersoll	3	46,698.00		
Innisfil Twp.	1			19,325.00
Jarvis	1			189,526.03
Kapuskasing	4			1,375,024.00
Kingston	5	115,966.00		
Kingston				
(Damon Smith Estates)...	1	9,850.00		
Kingston Twp.	1	13,950.70		
Kingston Twp.				
(Tecon Construction Company Ltd.).....	1	45,708.88		
Kingville	3	39,600.00		
Kitchener	5	678,060.00		
Lancaster Twp.				
(Shell Canada Ltd.)...	1		17,000.00	
Leamington				
(Bennie Lumber & Build- ing Materials Ltd.)...	1	12,907.00		
Lindsay	2	4,587.00	200,000.00	
Lindsay				
(Dominion Rubber Co. Ltd.).....	1	5,600.00		
(John R. Jack Construc- tion Ltd. & G.H. Clarke Limited).....	1	17,908.00		

WATER WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Supply and Purification	New Systems
Listowel	1	19,780.25		
London	8	2,996,844.00		
<u>London</u>				
(Cadia Development Limited).....	1	67,998.00		
(Clarkside Corpora- tion Limited).....	2	38,430.00		
(Dawnhurst Construc- tion Ltd.).....	1	32,000.00		
(Malahide Development Ltd.).....	1	33,000.00		
(Fellner Construction Company).....	1	90,055.00		
(Sherwood Forest Development Company)	1	89,947.00		
(Sunrise Development Limited).....	1	73,116.50		
(Second Upper Thames Development Ltd.)...	1	63,555.00		
x-Macaulay Twp.	1	+40,000.00		
Maidstone Twp.	1	9,619.00		
Malahide Twp.	1	12,000.00		
<u>March Twp.</u>				
(Atomic Energy of Canada).....	1	56,278.58		
(Wm. Teron Limited)..	1	44,389.80		
Markham	3	47,372.50	20,000.00	
Markham Twp.	10	475,504.84	38,575.00	
x-Marmora	1	55,644.00		
Merrickville	3	15,068.00		
Mersea Twp.	1	91,588.00		
Michipicoten Twp.	1	30,855.00		
x-Michipicoten Twp.	1		150,000.00	
Midland	2	14,512.86		
x-Midland	1		+82,500.00	
Mildmay	2	37,300.00		
Milton	1	23,673.52		
Mimico	2	99,767.60		
<u>Moore Twp.</u>				
(St. Clair Woods Developments Ltd.)...	1	50,600.00		
Morrisburg	1	8,679.00		
Mount Forest	1	15,000.00		

WATER WORKS CERTIFICATES (cont'd)

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MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Supply and Purification	New Systems
Napanee	2	33,856.42		
x-Neebing Twp.	1			+750,000.00
Neelon & Garson Tps.	1	7,500.00		
Nepean Twp.	2	141,904.35		
Nepean Twp.				
(Minto Construction Ltd., Ottawa).....	2	117,005.00		
(Belcor Lands Ltd.)..	1	8,400.00		
(Assaly Construction Ltd., Ottawa).....	2	82,194.20		
(Ontario Housing Corporation).....	2	404,621.40		
(T. Barr Realty Ltd.)	1	106,415.00		
(Woodvale Investments Ltd., Ottawa).....	1	31,550.00		
Newmarket	2	7,945.00		
New Hamburg				
(La-Shiel Homes Ltd.)	1	5,940.00		
New Liskeard	2	10,656.00		
New Liskeard				
(Norland Holdings Ltd.)	1	3,263.00		
Niagara Falls	4	309,907.75		
Niagara Twp.	1	10,404.83		
Nipigon (Cameron Falls)				
H.E.P.C.	1		800.00	
Nipigon Twp.	1	7,500.00		
North Bay	2	144,511.10		
Oakville	8	456,626.18		
Orangeville	4	29,275.09	26,000.00	
Orangeville				
(Credit Mountain Land Ltd.).....	1	2,587.50		
(Rubin Corporation)...	1	2,492.91		
Orillia	4	86,690.80		
Oshawa	13	301,514.75	450,000.00	
*Oshawa				
(Holshaw Ltd., Toronto).....	2	47,775.00		
Ottawa	18	637,438.00	69,019.00	
Owen Sound	1		+1,910,000.00	
*Oshawa				
(Harsam Investments Limited, Toronto).....	1	57,750.00		

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Supply and Purification	New Systems
Paris	1	32,000.00		
Penetanguishene	1	5,670.00		
x-Percy Twp.	2			177,400.00
Perth	2	13,700.00		
Peterborough	8	262,003.25	1,350,000.00	
<u>Peterborough</u> (Trent University)....	1	80,970.00		
Petrolia	1	1,820.00		
Pickering Twp.	3	49,300.00		
Playfair Twp. (Ramore)	1	700.00		
Plympton Twp.	1	2,800.00		
x-Point Edward	2	20,790.00		
Port Arthur	2	152,396.76		
<u>Port Arthur</u> (Lakehead Developers Limited).....	2	43,300.00		
Port Colborne	5	410,207.23	93,000.00	
<u>Port Dover</u> (Mr. J. Jackson).....	1	4,576.00		
Port Hope	3	15,540.00		
Port Perry	2	4,670.48		
Port Stanley	1	950.00		
Preston	3	43,708.75		
x-Rayside Twp. (Azilda Area).....	1			+387,400.00
<u>Red Lake</u> (H.E.P.C., Ear Falls)...	1		800.00	
Red Lake Twp.	1	+61,000.00		
Red Rock I.D.	2	940.00	5,210.00	
<u>Red Rock I.D.</u> (Domtar Newsprint Ltd.)	1	12,500.00		
Riverside	2	9,105.00		
<u>Riverside</u> (Head Construction Co. Ltd., Windsor).....	1	17,963.00		
<u>Romney Twp.</u> (Ontario Dept. of Lands & Forests).....	1	101,030.00		
(Lakeshore Realty Ltd., Kingsville).....	1	6,000.00		

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Supply and Purification	New Systems
St. Thomas	3	155,000.00		
x-Saltfleet Twp.	1	44,000.00		
<u>Saltfleet Twp.</u>				
(W. Grisenthwaite Developments Ltd.)...	1	12,500.00		
Sandwich East Twp.	2	11,139.10		
Sandwich South Twp.	2	19,692.00		
Sandwich West Twp.	14	238,447.00		
Sarnia	3	6,532.00		
<u>Sarnia</u>				
(Hay Construction Ltd.)	2	46,680.00		
(Lambton Lands Ltd.)...	1	5,403.55		
Sarnia Twp.	1	9,400.00		
<u>Sarnia Twp.</u>				
(Algore Developments Limited).....	1	3,166.50		
Sault Ste. Marie	6	397,838.89		
<u>Sault Ste. Marie</u>				
(John Alo Developments Limited).....	1	46,100.00		
(Elliott Lumber Co.)...	1	10,881.00		
Scarborough Twp.	37	1,126,052.01		
Shelburne	1	13,636.82		
Simcoe	1	177,928.00		
<u>Simcoe</u>				
(Gibson & Beckett Con- struction Co. Ltd.)....	2	22,198.00		
<u>Smooth Rock Falls</u>				
Abitibi Power & Paper Co. and municipality)..	1		515,000.00	
Sombra Twp.	1	5,780.00		
<u>Sombra Twp.</u>				
(Chinook Chemical Corpor- ation Ltd., Toronto)....	1		616.00	
(Canadian Industries Ltd., Montreal).....	1		105,000.00	
Southampton	1	28,828.00		
<u>Stanley Twp.</u>				
(Mr. Russell Grainger, Zurich).....	1	1,220.00		
Stouffville	1	4,550.00		
Stratford	13	204,641.80	1,300.00	
Strathroy	2	3,693.48		

- 113 - WATER WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Supply and Purification	New Systems
Streetsville	1	11,743.00		
Sturgeon Falls	1	10,127.00		
<u>Sturgeon Falls</u> (Riverview Development Limited).....	1	4,525.00		
Sudbury	11	402,032.87	255,000.00	
<u>Sudbury</u> (Mr. H. Soloy).....	1	10,139.00		
(Acme Enterprises).....	1	11,335.62		
Sydenham Twp.	1	21,140.00		
Thessalon	1	71,830.00	183,000.00	
Thornbury	1	7,578.30		
Thorold	1	200,000.00		
Thorold Twp.	3	16,230.13		
Thorold Twp. (Port Robinson).....	1			304,342.00
Tilbury	3	51,591.00		
Tilbury North Twp. (P. V. of Stoney Point)	1		202,400.00	
Tillsonburg	2	725,833.56		
Timmins	1	6,050.00		
Tisdale Twp.	1	3,160.00		
Toronto- Metro	13	9,001,937.50		
Toronto Twp.	30	1,221,162.60		
<u>Toronto Twp.</u> (Carl's Pharmacy Ltd.)	1	867.75		
(Dalewood Investments Limited).....	1	170,695.00		
(Deering Construction Ltd., Downsview).....	1	12,404.12		
(Goldmar Developments Limited).....	1	52,606.42		
(Olive Martin Ltd.)....	1	14,840.00		
(Mr. E. Muursepp).....	1	7,747.00		
(Shields Snow & Asso- ciates Ltd.).....	1	21,139.26		
Tottenham	1	5,000.00		
Trenton	2	44,080.00		
x-Vankleek Hill	1			383,361.50
Vaughan Twp.	2	23,200.00		
<u>Verulam Twp.</u> (Mr. L. P. Skitch, Fenelon Falls).....	1		2,412.50	

WATER WORKS CERTIFICATES (cont'd)

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MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Supply and Purification	New Systems
Wallaceburg	9	97,760.00		
Waterford	2	9,400.00		
Waterloo	7	309,150.00		
Waterloo (Dorwood Development Limited).....	1	5,844.00		
(Lakeshore Village Waterloo Limited)....	1	192,673.00		
Watford	1	4,300.00		
Welland	4	32,700.00		
Wheatley	3	154,658.00		
Whitby	1	11,991.00		
Whitby Twp.	1	9,760.00		
x-Wicksteed Twp. (Hornepayne)	1			219,800.00
Widdifield Twp.	3	75,550.30		
Wilmot Twp. (Mr. C. Swartzentruber, Waterloo).....	1	3,000.00		
Windsor	2	1,036,800.00		
Woodbridge	1	3,600.00		
Woodstock	5	73,819.00		
Yarmouth Twp. (A. Pol Construction Ltd., St. Thomas).....	1		7,200.00	
York Twp.	1	2,127.00		
York East Twp.	1	6,200.00		
York North Twp.	27	769,361.70		
TOTALS	721	\$ 35,304,337.66	\$ 6,350,330.50	\$ 2,872,288.53

x- OWRC project

+ preliminary approval only - included in total number of certificates, not included in total estimates

- 115 - CERTIFICATES ISSUED RE SEWAGE WORKS FOR THE YEAR 1965

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
Acton	1	10,000.00		
Ajax	1	27,859.00		
Alexandria	1	13,920.00		
Alliston	1	132,210.00		
Almonte	1	19,600.00		
Amherstburg, Anderdon and Malden.....	1	162,873.00	(increase in estimate only)	
Ancaster Twp. (Dundana Homes Limited)...	1	65,139.80		
Armstrong Twp.(Police V. of Earlton).....	2			132,560.00
Arnprior	3	64,570.66	494,500.00	
x-Arthur	1	+37,000.00		
Atikokan Twp.	2	58,000.00		
Aylmer	3	45,225.00		
Bancroft	1	51,939.25		
Barrie	12	684,302.51		
<u>Barrie</u> (Crosley-Bernick Con- struction).....	1	4,546.50		
x-Beeton	1			+206,700.00
Beeton	1	16,913.00	(storm sewer)	
Belle River	4	22,798.35		
Belleville	8	419,453.00		
<u>Belleville</u> (Barkel Developments Limited).....	1	73,605.00		
(J.Gajdicar & Son Ltd. and J.L. Farrell).....	1	8,600.00		
Bolton	1		+210,000.00	
Bowmanville	1	21,650.00		
Bradford	1	7,600.00		
Brampton	3	67,660.00		
<u>Brampton</u> (Peel Village Developments Limited).....	1	131,576.00		
Brantford	9	840,831.00		
<u>Brantford</u> (Grand Woodlands Ltd.)...	1	33,300.00		
Brantford Twp.	2	24,911.40		
x-Brighton	2	99,800.00		
<u>Brighton Twp.</u> (Federal Department of Justice).....	1		144,025.00	

SEWAGE WORKS CERTIFICATES (cont'd)

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MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
Brockville	4	34 770.00		
<u>Bruce Twp.</u>				
(Central School Board)...	1		11 067.51	
Burlington	34	2,652,825.25		
<u>Burlington</u>				
(George Porteous & Son Builders Ltd.).....	1	30,127.00		
(Pinedale Estates).....	2	151,142.95		
(Woodland Estates).....	2	186,818.71		
Campbellford	1	5,700.00		
Cardinal	1	2,400.00		
Carleton Place	1	10,899.00		
<u>Charlottenburgh Twp.</u>				
(St. Lawrence Sanitorium, Cornwall).....	1		5,200.00	
Chatham	11	503,845.00		
x-Chatham	2	194,673.66		
Chelmsford	1		46,000.00	
Chesley	1	7,990.00		
Chinguacousy Twp.	2	650,200.00		
<u>Chippawa</u>				
(Norton Company).....	1	15,409.00		
Clinton	2	249,612.00		
Cobden	1	32,000.00		
Cobourg	3	121,348.30		
Cochrane	1		180,000.00	
Collingwood	4	270,800.00		
<u>Collingwood Twp.</u>				
(Georgian Peaks Resorts Limited, Toronto).....	1		13,450.00	
Cookstown	1	30,760.00		
Cornwall	7	72,678.09		
x-Cornwall	2	771,200.00		
x-Cornwall	1	+308,700.00		
Cornwall Twp.	1	149,000.00		
Crystal Beach	1	43,075.72		
Deep River	4	75,797.70		
<u>Dorchester South Twp.</u>				
(School Board).....	1		10,000.00	
<u>Dresden</u>				
(Canadian Cannery Ltd.)..	1		5,500.00	

SEWAGE WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
Dryden	4	691,647.50	320,000.00	
Dundas	1	165,718.96		
<u>Dundas</u> (Monarch Construction Ltd., Toronto).....	1	196,300.00		
Dunnville	3	52,998.00		
x-Durham	1	+16,675.00		
x-Dutton	1			+234,375.00
Eastview	1	295,615.10		
<u>Elizabethtown Twp.</u> (Mr. A. Fleck, Brockville).....	1		23,000.00	
Elmira	1		700.00	
Elmvale	1	+250,000.00		
x-Emo Twp.	1		+82,000.00	
<u>Ernestown Twp.</u> (Amherst Associates)...	1	71,310.92		
(BP Canada Ltd., Montreal).....	1		49,900.00	
Etobicoke Twp.	84	2,437,659.08		
<u>Euphemia Twp.</u> (Central School Board)..	1		4,850.00	
Exeter	3	32,984.50		
<u>Exeter</u> (Mr. G.E.A. Dow).....	1	9,789.00		
x-Fauquier Twp. (Police V. of Moonbeam).....	1	3,565.00		
Fauquier Twp. (Police V. of Moonbeam).....	1	1,525.00		
Fenelon Falls	1	77,978.00		
Fergus	1	12,311.00		
<u>Foley Twp.</u> (Camp Wakana).....	1		5,000.00	
Fort Frances	1	68,000.00		
Fort William	1	39,850.00		
<u>Fort William</u> (Lakehead Developers Ltd., Port Arthur).....	2	205,000.00		
<u>Fredericksburgh N. Twp.</u> (Imperial Oil Ltd.)....	1	46,041.00		

SEWAGE WORKS CERTIFICATES (cont'd)

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MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
Galt	10	753,131.89		
x-Glencoe	1			+490,000.00
Gloucester Twp.	1	383,380.00		
x-Gloucester Twp.	1	+206,000.00		
x-Gloucester & Nepean Townships.....	1		+666,000.00	
Goderich	4	139,107.00	900,000.00	
Grimsby North Twp.	1	31,023.21		
Guelph	2	83,900.00		
<u>Guelph</u> (Ontario Department of Public Works).....	1	176,062.00		
x-Haileybury	1		+213,500.00	
Hamilton	11	1,736,496.69		
<u>Hamilton</u> (Robinson Contracting Company).....	1	16,020.00		
(Robert Shelley Construc- tion Company).....	1	2,348.00		
(DiCenzo Construction Co. Ltd.).....	2	36,620.00		
(Abbotsford Homes Ltd.)..	2	104,142.00		
(Sunshine Homes Ltd.)....	1	23,247.00		
(Cochren Construction Limited).....	1	9,820.00		
(Frisco Homes Ltd.).....	1	11,385.00		
(Queenston Development Company Ltd.).....	1	183,100.00		
(Edmac Developments Ltd.).....	1	168,741.00		
(Steinngel Construction Limited).....	1	5,150.00		
(Mrs. M. Sinclair).....	1	4,240.00		
x-Harriston	2	88,710.00		
<u>Hay Twp.</u> (Bluewater Rest Home, Zurich).....	1		5,000.00	
Hesperia	3	41,550.00		
Huntsville	1	60,000.00	(omitted in total estimates)	
x-Ignace Twp.	2			168,000.00
Ingersoll	3	171,998.00		

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
Jarvis	2			195,044.86
Kapuskasing (Amalgamated Area)	4			1,214,400.00
King Twp. (Police V. of King).....	1	11,142.78		
Kingston	12	145,043.73	95,000.00	
<u>Kingston</u> (Damon Smith Estates)...	1	13,050.00		
Kingston Twp.	1	24,234.75		
<u>Kingston Twp.</u> (Tecon Construction Company).....	1	83,774.00		
Kingsville	3	54,609.00	+495,380.00	
Kitchener	6	2 510,277.17		
<u>Lancaster Twp.</u> (Shell Canada Ltd.)...	1		24,000.00	
<u>Leamington</u> (Bennie Lumber & Build- ing Materials Ltd.)...	1	27 284.00		
Leaside	1	18,831.25		
Lindsay	5	158,902.35		
London	16	6,734,365.34	640,000.00	
<u>London</u> (Clarkside Corporation Limited).....	3	144,102.00		
(Sifton Construction Company Ltd.).....	1	59,950.00		
(Dawnhurst Construc- tion Ltd.).....	1	71,000.00		
(Malahide Development Ltd.).....	1	124,000.00		
(Second Upper Thames Development Ltd.).....	1	231,100.00		
(Sherwood Forest Develop- ment Company).....	1	279,425.00		
(Rockwynne Developments Limited).....	1	32,300.00		
(Western University).....	1	40,700.00		
(Mr. A. Wrona).....	1	2,100.00		
(Sunrise Development Limited).....	1	218,378.00		
x-Lucan	1	22,760.00		

SEWAGE WORKS CERTIFICATES (cont'd)

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MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
March Twp. (Wm. Teron Ltd.).....	2	168,876.98		
x-Markdale	1			+273,300.00
Markham	3	222,240.00		
Markham (Canarama(Ont.) Ltd.)	2	109,287.17		
Markham Twp.	10	532,322.22	1,130,380.00	
Markham Twp. (Hengran Development Ltd.).....	1	261,050.00		
(York Central District High School Board)....	1	1,500.00		
x-Mattawa	1	+22,005.00		
Michipicoten Twp.	1	59,449.50		
Midland	4	115,712.00		
Milton	5	241,430.00	240,200.00	
x-Milverton	1			316,800.00
Mimico	1	5 000.00		
Moore Twp. (St.Clair Woods Develop- ment Ltd.).....	1	254,800.00		
(H.E.P.C.).....	1		55,000.00	
x-Mountjoy Twp.	2			117,500.00
Mount Forest	1	2,425.50		
Mount Forest (Mr. Harry Bye).....	1	4,600.00		
Napanee	2	48,866.25	25,000.00	
Nepean Twp.	3	347,640.65	+1,875,000.00	
Nepean Twp. (Assaly Construction Co. Limited).....	2	171,984.65		
(Barr Realty Ltd.).....	1	243,415.00		
(Belcor Lands Ltd.)....	1	5,700.00		
(Minto Construction Co. Limited).....	1	79,048.67		
(Ontario Housing Corp- oration).....	2	737,447.45		
(National Capital Commission).....	1	470,339.10		
(Wm. Teron Limited)....	1	13,930.00		
(Woodvale Investments Limited).....	1	83 981.00		

SEWAGE WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
<u>New Hamburg</u>				
(L-1-Shiel Homes Ltd.)..	1	10,433.00		
New Liskeard	3	33,766.50		
New Toronto	1	28,850.00		
Niagara	2	5,400.00		
Niagara Falls	8	443,066.79	9,000.00	
Niagara Twp.	1	2,741.00		
Nipigon Twp.	2	9,890.00		
North Bay	3	75,811.51		
Norwich	1	15,188.00		
 Oakville	 13	 891,820.24	 265,000.00 (site only)	
<u>Oakville</u>				
(Ford Motor Company of Canada).....	1		38,000.00	
(Board of Education)...	1		17,600.00	
Orangeville	5	48,180.20		
<u>Orangeville</u>				
(Credit Mountain Land Co. Ltd.).....	1	3,290.73		
(Rubin Corporation).....	1	2,344.85		
Orillia	6	268,300.64		
<u>Orillia</u>				
(Dougall-Wood Ltd.).....	1	77 280.00		
Oshawa	16	639,964.25	115,000.00	
<u>Oshawa</u>				
(Holshaw Ltd.).....	2	74,760.00		
(Harsam Investments)....	1	112,350.00		
(Georgian Motor Hotel)...	1		7,000.00	
<u>Otonabee Twp.</u>				
(Big Seven Motor Hotel Ltd.).....	1		28,000.00	
Ottawa	64	4,205,708.71		
Owen Sound	1	4,200.00		
 Paris	 1	 63,747.00		
x-Parry Sound	1	7,600.00		
Penetanguishene	2	97,645.00	166,300.00	
Perth	1	88,500.00		
Petawawa	1	4,025.00		
Peterborough	9	826,388.94		

SEWAGE WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
<u>Peterborough</u>				
(Dept. of Public Works) 1			20,000.00	
(Ontario Housing Corp- oration).....1		104,478.30		
(Trent University).....2		530,060.00		
Petrolia 3		66,171.00		
x-Petrolia 1		255,972.25	159,641.00	
<u>Petrolia</u>				
(Petrolia Investments Limited).....1		4,900.00		
x-Pickering 1				+490,000.00
Pickering Twp. 3		67,894.00		
x-Point Edward 1		39,305.00		
Port Arthur 4		188,308.00		
Port Arthur 1		+920,000.00		
<u>Port Arthur</u>				
(Lakehead Developers Limited).....3		283,150.00		
Port Colborne 2		61,980.00		
Port Credit 2		109,852.04		
<u>Port Dover</u>				
(Mr. J. Jackson).....1		5,887.00		
Port Elgin 1		19,448.00		
Port Elgin 1		+88,684.00	+69,150.00	
Port Hope 2		2,953.00	10,161.00	
Powassan 1		28,000.00		
Preston 6		284,943.78		
Red Lake Twp. 1				+289,000.00
<u>Red Rock I.D.</u>				
(Domtar Newsprint Ltd.) 1		12,500.00		
Renfrew 1		160,000.00		
x-Richmond 1				+204,000.00
<u>Richmond</u>				
(School Board).....1			16,100.00	
Richmond Twp. 2		63,400.00		
Riverside 2		141,609.00		
<u>Riverside</u>				
(Head Construction Co. Limited).....1		36,754.00		
<u>Rockland</u>				
(Mr. E. Laviolette).....1		9,380.00		
<u>Romney Twp.</u>				
(Dept. of Public Works) 1			43,000.00	

SEWAGE WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
St. Catharines	8	667,550.00	1,965,120.00	
<u>St. Catharines</u>				
(Lindey Ltd.).....	2	379,837.03		
(Homesites Ltd.).....	2	168,756.00		
(Decou Developments Ltd.)	1	70,568.61		
(Miscane Investment Ltd.)	1	45,056.00		
(St. Catharines Estates Ltd.).....	2	127,387.65		
(Fairlane Land Develop- ment Ltd.).....	1	72,000.00		
(P.J. Wall & Sons Ltd.)...	1	8,700.00		
(Mr. L.C. Forster).....	2	145,121.33		
(Mr. S.D. Costen).....	1	55,344.38		
(Upper Canada Estates)....	1	206,720.84		
(Wakil Valley Estates)....	1	37,000.00		
(Miss P. Covello).....	1	8,500.00		
(Brock University).....	1	344,285.00		
St. Clair Beach	1	9,901.00		
St. Marys	2	30,000.00		
St. Thomas	9	295,930.00		
Saltfleet Twp.	1	43,820.00		
x-Saltfleet Twp.	1	213,561.00		
<u>Saltfleet Twp.</u>				
(High School Board).....	1	26,000.00		
(Grisenthwaite Develop- ments Ltd.).....	1	37,140.00		
Sandwich East Twp.....	3	323,875.00		
Sandwich West Twp.....	7	210,521.12		
Sarnia	8	620,092.00		
<u>Sarnia</u>				
(Lambton Lands Ltd.).....	1	11,179.50		
(Hay Construction Ltd.)...	2	109,533.00		
Sault Ste. Marie	6	759,142.00	4,000.00	
x-Sault Ste. Marie	1	530,100.00		
<u>Sault Ste. Marie</u>				
(Elliott Lumber Co.).....	1	18,066.00		
(John Alo Developments Limited).....	1	75,100.00		
(Weyerhaeuser Canada Ltd.)	1	3,900.00		
Scarborough Twp.	40	4,632,235.29		
Shelburne	1	13,307.90		
Simcoe	1	282,430.00		
<u>Simcoe</u>				
(Gibson & Beckett Construc- tion Co. Ltd.).....	2	23,077.00		

SEWAGE WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
<u>Sombra Twp.</u>				
(Canadian Industries Limited).....	1		116,000.00	
Stafford Twp.	1	55,417.20		
x-Stirling	1	+79,019.00		
Stoney Creek	1	54,814.00		
Stratford	8	341,730.00		
<u>Stratford</u>				
(Oberlander Construction Limited).....	1	9,470.00		
Streetsville	3	43,091.15		
Sturgeon Falls	2	13,155.00		
Sudbury	9	1,382,185.00		
<u>Sudbury</u>				
(Acme Enterprises).....	1	16,600.30		
(Mr. H. Soloy).....	1	18,091.00		
Swansea	1	30,000.00		
Thessalon	1	21,000.00		
Thorold	2	431,000.00		
Thorold Twp.	1	113,790.00		
Tillsonburg	3	175,738.00		
Timmins	3	213,681.00		
Tisdale Twp.	1	2,839.00		
Toronto	42	8,379,295.00		
Toronto Metro	9	4,550,077.50	460,100.00	
Toronto Twp.	44	4,543,702.40		
x-Toronto Twp. and Metro Toronto.....	1		1,675,000.00	
x-Toronto Twp. and Metro Toronto.....	1		+3,500,000.00	
<u>Toronto Twp.</u>				
(Carl's Pharmacy Ltd.)...	1	4,601.00		
(Dalewood Investments Ltd.).....	1	632,564.70		
(Dearing Construction Ltd.).....	1	31,904.94		
(Goldmar Developments Limited).....	1	108,600.00		
(Palmwood Construction)...	1	3,465.00		
(South Peel Hospital)....	1	19,000.00		
(Olive Martin Ltd.).....	1	58,900.00		
(Mr. E. Muursepp).....	1	9,190.00		
(Board of Education)....	1		19,000.00	
(Peel County).....	1	84,114.71		
Trenton	4	72,583.00		

SEWAGE WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
Vaughan Twp.	1	4,500.00		
Walkerton	1	11,885.00		
Wallaceburg	3	61,500.00		
x-Wallaceburg	1	200,800.00		
x-Waterdown	1	6,380.00		
x-Waterdown	1	+272,000.00		
Waterloo	6	355,595.00		
x-Waterloo	1		+750,000.00	
<u>Waterloo</u> (Lakeshore Village Waterloo Ltd.).....	1	203,770.00		
x-Watford	1			+117,800.00
Welland	9	785,000.00		
Weston	2	60,000.00		
Whitby	4	534,395.61	+85,000.00	
Warton	1	4,853.25		
Widdifield Twp.	1	1,705.00		
x-Wilmot Twp. (Police V. of Baden).....	1			+383,660.00
Winchester	1	2,500.00		
Windsor	5	1,648,200.00		
Wingham	1	5,450.00		
x-Woodbridge	1			545,500.00
Woodstock	2	108,170.50		
<u>Woodstock</u> (Upper Thames River Conservation Authority)	1	5,353.00		
York Twp.	4	75,720.00		
York East Twp.	3	233,000.00		
York North Twp.	35	3,460,175.80		
TOTALS	1,023	\$83,472,504.65	\$9,570,794.51	\$2,690,804.86

x- OWRC project

+ preliminary approval only - included in total number of certifi-
cates, not included in total estimates

CERTIFICATES ISSUED RE INDUSTRIAL WASTES FOR THE YEAR 1965

MUNICIPALITY	Name of Company or private party	No. of Certi- ficates	Type of Treat- ment	Expenditure
Albion Twp.	Mr E Grogan. Bolton	1	lagoon	1,105.00
Brussels	R B Cousins Ltd	1	spray irrigation	1,276.02
Derby Twp	Mr. P. Abrams, Owen Sound	1	lagoon	3,500.00
Dundas	Mr. J DeFilippis, Hamilton	1	Settling tank	3,000 00
x-Essex	Municipal system to serve Stokely Van Camp	1	Aerated lagoon	149,400.00
Hibbert Twp.	Mr. L Kroonen Dublin	1	Spray irrigation	1 350.00
Maryborough Twp	Rothsay Concentrates	1	lagoon	4 000.00
Plantagenet S. Twp.	LaFabrique Laitiere Ltd., Prescott	1	holding pond & spray irrigation	21,000.00
Thurlow Twp.	Mr. Omar Chisholm, Belleville	1	lagoon	not shown
TOTALS		9		184,631.02

Division of Water Resources

K. E. Symons, Director
D. N. Jeffs, Assistant Director

The Division of Water Resources actively carried forward programs concerned with water management, licensing of water-well contractors, water resources surveys, test-drilling and well-construction projects, and hydrologic data. It also initiated projects associated with the International Hydrologic Decade and a study of the water resources of northern Ontario.

The organization of the Division was revised with four branches oriented to program activities replacing the former Ground Water and Surface Water branches.

DIVISIONAL ACTIVITIES

Cartography Section

The cartography section supported all programs of the Division by preparing base and final maps, charts and diagrams and procuring maps, plans, aerial photographs and mosaics from various sources. Major contributions were made to the Big Creek Survey, Synoptic Survey, and water management program, while significant progress was made in assignments associated with Big Otter Creek Survey, Northern Ontario Water Resources Survey and International Hydrologic Decade projects.

ARDA Projects

Three projects financially supported through the Agricultural Rehabilitation and Development Act were in progress. Two proposed programs were not accepted for support.

The Synoptic Survey of streamflow measurement and the water resources survey in Big Creek drainage basin were

carried forward from previous years and were both in stages of final report preparation at the end of the year. A water resources survey in the drainage basin of Big Otter Creek commenced during the year and extensive field work was accomplished.

International Hydrologic Decade Program

In October 1961, UNESCO conceived the idea of a program of international co-operation in scientific hydrology. The major objective of such an international program was "to accelerate the study of water resources and the regimen of waters with a view to their national management in the interest of mankind, to make known the need for hydrological research and education in all countries, and to improve their ability to evaluate their resources and use them to the best advantage".

Commitments made by the Federal Government and provincial governments in this program resulted in authorization for the Division of Water Resources to undertake a number of projects. The Hydrologic Data and River Basin Research branches were assigned the responsibility of carrying out the Commission's International Hydrologic Decade projects. The following five projects were submitted in turn to the Ontario Committee and the National Committee for the International Hydrologic Decade for acceptance:

1. Representative Basin Studies
2. Experimental Basin Studies
3. Assessment of Surface Water Runoff
4. Assessment of Ground Water
5. Ontario Hydrologic Atlas

Representative Basin Studies, Assessment of Ground Water, and Assessment of Surface Water Runoff were approved as projects. Approval of Experimental Basin Studies was held in abeyance by the National Committee pending more information being made available. The Ontario Hydrologic Atlas was not given approval as a Decade project; however, material will be assembled and supplied by the Commission for the atlas which will be undertaken as a national project. Progress is reported by branches.

The Commission is represented on the Ontario Committee for the International Hydrologic Decade and also on the Scientific Subcommittee of the Ontario Committee.

Northern Ontario Water Resources Survey

Increasing interest in northern waters lead to the announcement by the Prime Minister that the Ontario Water Resources Commission would undertake a study of the water resources of northern Ontario and that the provincial study would be co-ordinated with related studies to be carried forward by the federal government. Five main river basins are involved, the Moose, Albany, Attawapiskat, Winisk and Severn. Little is presently known of the water resources over much of the area. The study will include an inventory of water resources and uses and an assessment of potential uses for a variety of purposes with respect to Ontario's needs.

With a view to facilitating the planning of field work to be commenced in 1966, two reconnaissance trips were made through this northern area to acquaint those who will be involved in these studies with the physical features and facilities of the area. Discussions were held with a number of consultants and service firms who were interested in participating in the studies. A start was made on the accumulation of basic maps and other data. Meetings of the Federal-Provincial Co-ordinating Committee for Northern Ontario Water Resources Studies as well as the Ontario section of the Committee were attended.

Staff of the Division participated in the installation of two streamflow gauging stations, one on the Attawapiskat River and one on the Winisk River.

SURVEYS AND PROJECTS BRANCH

The Surveys and Projects Branch was active in six major programs related to water resources surveys and water supply projects: municipal hydrogeologic surveys, test-drilling and well-construction projects, drainage basin surveys, county water resources surveys, regional studies of water supply requirements, and special investigations of water-supply problems.

Work completed or in progress included nine municipal hydrogeologic surveys, eight test-drilling or well-construction projects, 56 special investigations, two drainage basin surveys, three county surveys and three regional studies. Work was initiated on the northern Ontario water resources survey. The number of surveys, investigations and projects is presented graphically in Figure 1.

DIVISION OF WATER RESOURCES
SURVEYS AND PROJECTS BRANCH

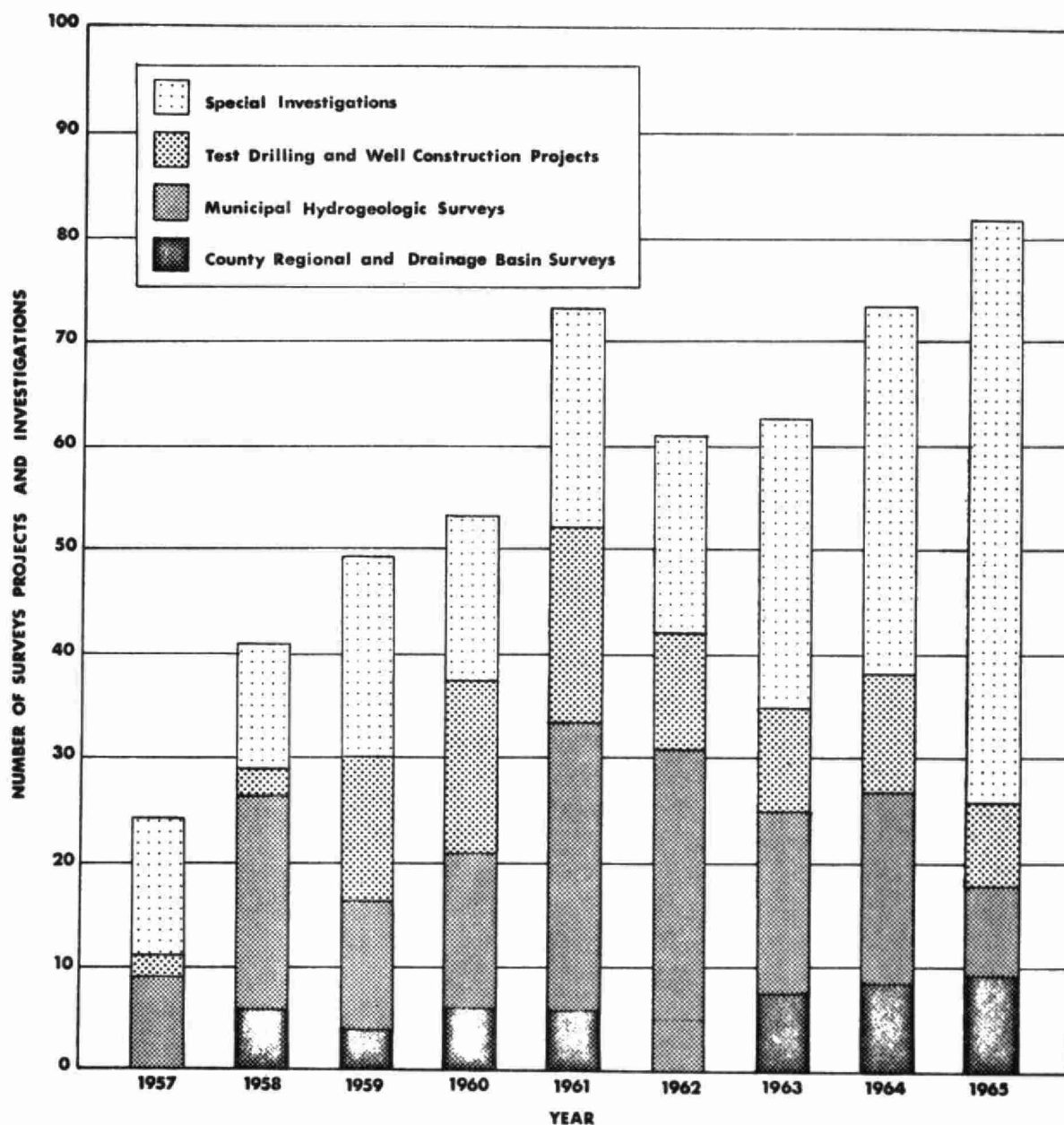


FIGURE 1 ACTIVE AND COMPLETED SURVEYS
PROJECTS AND INVESTIGATIONS

Drainage Basin Surveys

The preparation of maps and the text of the report for the water resources survey of the Big Creek drainage basin was carried on intermittently throughout the year. By the end of the year most of the maps were printed and the report was partially completed.

In May a water resources survey of the Big Otter Creek drainage basin was commenced. Field work to assemble hydrologic and geologic data was carried on throughout the summer and the preparation of maps, tables and the text of the report was in a satisfactory state of progress by the end of the year.

County Surveys

A report on the water resources survey of the County of Frontenac received final editing, and hydrogeologic maps for the County of Halton were completed. Field work was carried out for the water resources survey of the County of Waterloo, and the Branch's contribution to the text of the report was completed, and the preparation of maps was in progress.

Regional Studies of Water Supply Requirements

Contributions were made to three reports prepared jointly with the Division of Sanitary Engineering on studies of water supply requirements for three regions in the province: the County of Lambton, the County of Kent and the Lower Grand Valley. The studies were related to existing municipal and private water supplies. The Branch contributed material to and participated in reviews of consulting engineers' reports on regional studies.

Municipal Hydrogeologic Surveys

Reports were completed with respect to five municipal hydrogeologic surveys carried out in the previous year and three surveys carried out during 1965. The report concerning another survey carried out in 1965 was in progress at the end of the year. The reports contained an assessment of the local ground-water conditions and recommendations regarding the exploration and development of the resource.

Surveys were carried out for the Village of Tavistock, the Township of Dover, the Police Village of Plattsville and the City of Galt.

Test-Drilling and Well-Construction Projects

The Branch carried out four test-drilling projects and two well-construction projects during the year. Test-drilling projects were carried out for the Township of Bucke, the Township of Rayside, the Village of Plantagenet and the Village of Winchester. Well construction was carried out for the Town of Brampton and the Police Village of Orono. At the end of the year, preparations had been completed or were in progress for a test-drilling project for the Town of Richmond Hill and a well-construction project for the Town of Midland.

The test-drilling projects at the townships of Bucke and Rayside were unsuccessful in locating ground-water sources of supply. The test-drilling at Plantagenet and Winchester resulted in the development of new wells. Well construction was successful at Orono and Brampton. Because of an urgent need for water the well at Brampton was connected to the system before development was fully completed and at the end of the year the development work still remained to be done as the need for water prevented the shut-down of the well. The test-drilling project at Richmond Hill was delayed in starting by difficulties in acquiring options on test-drilling sites. The calling of tenders for the Midland well-construction project was postponed to 1966 in order that tenders for all phases of the project could be called simultaneously.

Special Investigations

Fifty-six special investigations regarding ground-water contamination and water-supply problems were active or completed. Reports were completed for 43 investigations carried out in 1965.

Eight investigations involved the analysis and evaluation of the capabilities of municipal water supply wells; 14 investigations were made into problems of ground-water contamination; 20 investigations were made to evaluate the probable effects of the disposal of sanitary and industrial wastes on local and regional ground-water resources; and 14 investigations were made to provide assistance with regard to special water-supply problems.

DIVISION OF WATER RESOURCES
WATER AND WELL MANAGEMENT BRANCH

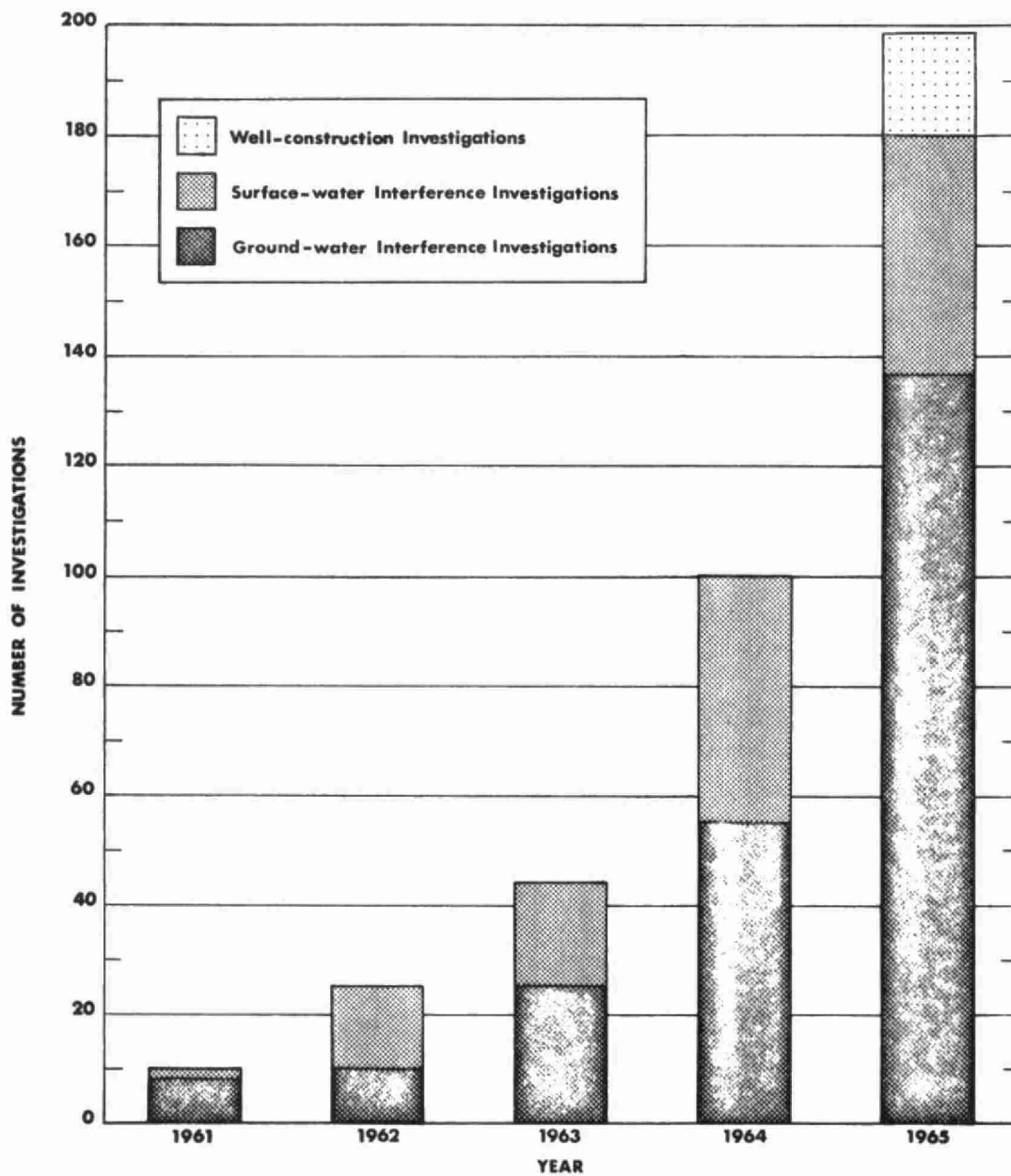


FIGURE 2 TYPES OF INVESTIGATIONS

Note: Well-construction Investigations prior to 1965 were not recorded statistically

WATER AND WELL MANAGEMENT BRANCH

The work of the Water and Well Management Branch was carried out under two programs, water-management and well-contractor licensing. The majority of the staff was active in the water-management program dealing with the processing of applications for permits to take water and investigations of water-supply interference problems. The remainder of the staff was concerned with the well-contractor licensing program which involves the location of wells, inspection of wells for sanitary construction, investigation of complaints by the public against well contractors and associated office work.

Four summer students were again employed inspecting water takings and assisting in the enforcement of those sections of The Ontario Water Resources Commission Act pertaining to the permit program.

Figure 2 shows graphically the water management investigations carried out during the years 1961 to 1964, inclusive, and the water management and well construction investigations completed in 1965.

In comparison to 1964 the number of permits issued for takings of water from surface-water sources more than doubled, while the permits for ground-water sources remained approximately the same. The large number of surface-water applications received in 1965 was considered to be due to the more intensified field investigations carried out during the year.

Water Management Program

Applications and Permits

One hundred and thirty-six applications for permits to take water were carried forward from 1964. In 1965, 821 applications were received. Of the 1965 applications, 711 were for takings of water from surface-water sources, 102 were for takings from ground-water sources and eight were for combined ground and surface-water sources.

Seven hundred and six permits and 16 letters of approval were issued during 1965. Of the permits and letters of approval issued, 589 were for irrigation, 48 were for industrial purposes, 31 were for municipal supply purposes, seven were for commercial purposes and 47 were for recreational purposes. Eighty applications for permits were found to be for takings not requiring authorization under the legislation and the applicants were so notified. At the end of the year 71

applications were under active consideration and 84 applications were awaiting additional information.

Six maps showing the locations of water takings and other permit data were completed. To date, 11 permit maps have been prepared. All maps were revised periodically and the information brought up to date.

Figure 3 shows graphically the amounts of approved water taking since 1961 and information concerning the sources and purposes of the takings.

Table 1 contains a summary of water permit data for 1965. A comparison of permit data for the period 1961 to 1965, inclusive, appears in Table 2.

Table 3 shows a summary of the amounts of water taking approved by permit for various purposes since 1961.

Water Management Investigations

One hundred and thirty-eight ground-water and surface-water interference problems were investigated during the year. Compared to 1964, the number of ground-water investigations completed almost doubled while the number of surface-water complaints investigated remained approximately the same. The increased number of ground-water investigations carried out in 1965 was attributed, in part, to the growing awareness by the public of the part being played by the OWRC in the management of water resources.

Ground-Water Interference Investigations

Ninety-five investigations of ground-water interference problems were made and reports were completed for 47 problems during the year. A number of investigations were made at the request of the Department of Highways, Ontario. Many of these required repeated field trips in order to gain necessary information.

The number of investigations carried out in the various municipalities is indicated below; the figures in brackets indicate the number of investigations in municipalities where more than one problem occurred:

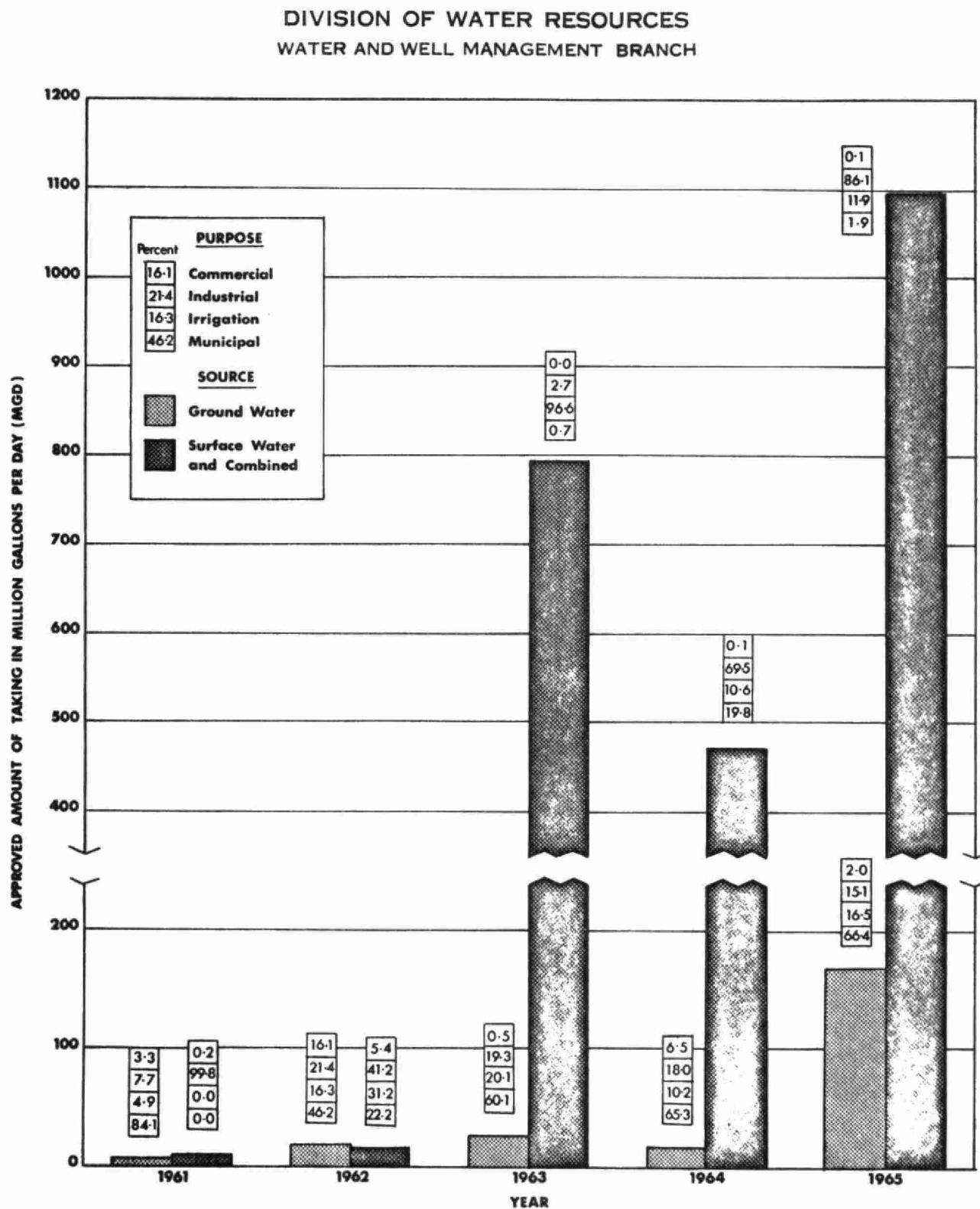


FIGURE 3 AMOUNT OF WATER TAKING APPROVED ACCORDING TO YEAR SOURCE AND PURPOSE

TABLE 1. SUMMARY OF WATER PERMIT DATA FOR 1965

SOURCE	APPLICATIONS						Amount of Water Taking Approved By Permit * (MGD)
	Carried Forward from 1964	Received in 1965	Refused Withdrawn or not Required	APPROVED		Under Consider- ation on December 31, 1965	
				By Letter	By Permit		
Ground Water	45	102	17	14	63	53	16.79
Surface Water	88	711	59	2	638	100	1097.79
Ground and Surface Water	3	8	4	-	5	2	1.05
TOTALS	136	821	80	16	706	155	1115.63

* Does not include water takings approved by letter of approval or by 44 permits where conditions of taking rather than amounts were specified.

TABLE 2. COMPARISON OF PERMIT DATA FOR PERIOD 1961 - 1965

SOURCE AND PURPOSE OF WATER TAKING	1961		1962		1963		1964		1965	
	No. of Permits Issued *	Amount (MGD)	No. of Permits Issued *	Amount (MGD)	No. of Permits Issued *	Amount (MGD)	No. of Permits Issued *	Amount (MGD)	No. of Permits Issued *	Amount (MGD)
GROUND WATER										
Commercial	4	0.26	15	3.02	3	0.13	14	1.08	4	0.33
Industrial	5	0.60	19	4.01	11	5.15	10	2.98	21	2.54
Irrigation	3	0.38	14	3.05	23	5.36	10	1.70	28	2.77
Municipal	8	6.53	32	8.65	30	16.06	45	10.86	24	11.15
Recreation	-	-	-	-	-	-	1	0.14	-	-
	20	7.77	80	18.73	67	26.70	80	16.76	77	16.79
SURFACE WATER										
Commercial	1	0.02	20	0.86	2	0.23	4	0.40	3	1.03
Industrial	6	9.74	7	6.44	14	21.23	27	326.16	27	945.37
Irrigation	-	-	21	4.88	2599	767.13	230	49.79	556	131.00
Municipal	-	-	4	3.48	7	5.18	7	92.76	7	20.34
Recreation	1	-	17	-	11	0.93	49	0.09	47	.05
	8	9.76	69	15.66	2633	794.70	317	469.20	640	1097.79
GROUND AND SUR- FACE COMBINED										
Commercial	-	-	-	-	-	-	-	-	-	-
Industrial	-	-	-	-	-	-	-	-	-	-
Irrigation	-	-	2	0.95	6	1.6	-	-	5	1.05
Municipal	-	-	1	-	-	-	-	-	-	-
Recreation	-	-	-	-	-	-	-	-	-	-
	-	-	3	0.95	6	1.6	-	-	5	1.05
GRAND TOTAL	28	17.53	152	35.34	2706	823.00	397	485.96	722	1115.63

* Includes Letters of Approval

Note: The amounts do not include water takings approved by letters of approval or by permits where conditions of taking rather than amounts were specified.

TABLE 3. SUMMARY OF AMOUNTS OF TAKING APPROVED BY PERMIT FOR VARIOUS PURPOSES

PURPOSE	1961 MGD	1962 MGD	1963 MGD	1964 MGD	1965 MGD
Commercial	0.28	3.88	0.36	1.48	1.36
Industrial	10.34	10.45	26.38	329.14	947.91
Irrigation	0.38	8.88	774.09	51.49	134.82
Municipal	6.53	12.13	21.24	103.62	31.49
Recreation	-	-	0.93	0.23	0.05
TOTALS	17.53	35.34	823.00	485.96	1115.63

Note: The amounts do not include water takings approved by letters of approval or by permits where conditions of taking rather than amounts were specified.

Townships of Albion and Tecumseth, Ancaster, Chinguacousy (53), Darlington (2), Dorchester North and Nissouri West, Dumfries North, Esquesing (3), Essa, Flamborough West, Garafraxa East, Guelph, Kingston, McNab, Mariposa, Markham, Monaghan, Oakville, O'Brien, Oro, Pittsburgh, Scarborough, Shuniah, Thurlow, Toronto, Uxbridge, Vaughan (2), Waterloo (2), Westminster (4) and Yarmouth (2);

Towns of Hespler (2) and Newmarket;

Cities of Galt and Hamilton.

The more comprehensive well-interference studies were made in the following municipalities:

Township of Chinguacousy: Brampton-Heart Lake and
Brampton-Huttonsville areas;
Township of Dumfries North: Galt test-drilling site;
Township of Westminster: London-White Oak area;
Township of Yarmouth: St. Thomas area.

Township of Chinguacousy - Three claims for compensation for remedial work undertaken on water supplies to the Heart Lake area due to the operation of the Brampton municipal wells were settled by Brampton in 1965.

Staff worked in the Huttonsville area during the year investigating fifty-three complaints of well interference and observing water levels in observation and private wells. The Town of Brampton made water services available to 21 residents of the community of Huttonsville and had one well constructed for a resident in the vicinity of Eldorado Park during 1965. The water supplies were restored by Brampton as they had been seriously affected by the operation of the Brampton-Huttonsville municipal well.

Township of Dumfries North - A survey was carried out in the Township of Dumfries North to establish the existing surface and ground-water conditions prior to the commencement of test-drilling for a new municipal water supply by the City of Galt. Three stream gauges and five staff gauges were installed in the area and information was obtained on 71 private wells. Arrangements were made to measure a number of the wells regularly. The test-drilling project proved unsuccessful and was abandoned. All but one staff gauge were removed and the measuring of the wells was discontinued indefinitely.

1965

Township of Westminster - Four complaints of interference regarding ground-water conditions were investigated in the area. During the year two claims for compensation against the London Public Utilities Commission for remedial work alleged to be required on private wells due to the operation of the London-White Oak municipal wells were rejected by the Division of Water Resources after investigations had taken place. Three claims were under consideration at the end of the year and one claim was settled by the London Public Utilities Commission.

Township of Yarmouth - Staff investigated 13 complaints of well interference due to the operation of the St. Thomas-McQuiggan municipal well. A report was being prepared at the end of the year.

Surface Water Interference Investigations

Forty-three investigations of complaints concerning interference with surface-water supplies or depletion of streamflow were made and reports were completed for all the investigations during 1965.

The number of investigations carried out in the various municipalities is indicated below; the figures in brackets indicate the number of investigations in municipalities where more than one problem occurred:

Townships of Artemesia, Bayham, Brighton, ^{Artemesia}
Caradoc, Carden, Charlotteville (2), ^{Mud Creek}
Charlotteville and Walsingham South, ^{Fisher's Creek}
Chinguacousy (2), Dumfries North,
Esquesing, Essex, Gwillimbury East,
King (2), Malahide (2), Markham (3),
Mersea, Moulton and Wainfleet, Murray,
Nassagaweya, Nissouri East and Zorra
West, Oakville, Orillia, Pickering,
Reach, Tecumseth (2), Toronto, Toronto
Gore, Tosorontio (2), Vaughan (2),
Waterloo and Whitchurch (3);

City of Owen Sound. ^{prob. d}

The most comprehensive surface-water interference study was carried out in the townships of Charlotteville and Walsingham South.

Townships of Charlotteville and Walsingham South - A complaint of streamflow depletion caused by excessive withdrawals of water by tobacco irrigators from Mud Creek, a tributary of Dedrick Creek, was investigated. It was found that streamflow was inadequate to meet the simultaneous needs of all users along the stream. As a result, all permittees taking water directly from the stream were advised by letter to curtail their takings. Since the problem of insufficient water supply for downstream users of Mud Creek is sure to recur every prolonged dry weather period, it was suggested to all users that consideration be given, either on an individual or collective basis, to the construction of water supply reservoirs. The agricultural representative and the conservation authority were informed of the situation and permittees in the watershed were made aware of the provincial subsidy programs available for reservoir construction. Unless some constructive action is taken by the persons involved, further restrictions on takings will likely be necessary during dry weather conditions.

Water Taking Investigations

Farm to farm surveys were carried out in the townships of Felham, Louth, Thorold, Flamborough East and Flamborough West, in the Twelve Mile Creek and Grindstone Creek drainage basins. The surveys were designed to determine the number of users of water who were subject to regulation by permit. Twenty-six of the residents required permits.

In addition 690 other farms were visited by members of the staff, 300 applications for permits to take water were received from those visited, irrigation was not practised on 270 farms visited, 26 takings did not require authorization from the Commission and 94 of the residents on farms visited were the holders of permits whose water-taking practices were being checked.

Well Contractor Licensing Program

Well Contractors

Three hundred and ninety-three licences were issued in 1965 for carrying on the business of boring or drilling wells for water. Seventeen licences were held by boring contractors and three hundred and seventy-six licences were held by drilling contractors. Records for 8,381 water wells were received by the Branch during 1965. The number of records received annually between 1951 and 1965 is shown in Figure 4. The three inspectors visited the water-well contractors on 968 occasions and made 8,857 checks on the locations of wells and 413 checks for sanitary well construction.

DIVISION OF WATER RESOURCES
WATER AND WELL MANAGEMENT BRANCH

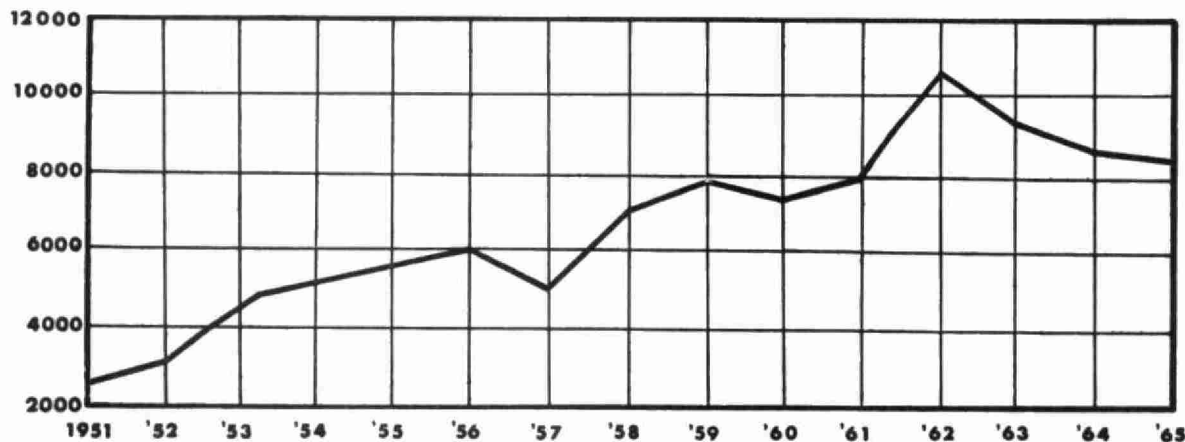


FIGURE 4 NUMBER OF WATER WELL RECORDS RECEIVED ANNUALLY

Meetings initiated in 1964 with representatives of the Canadian Water Well Contractors Association to review the legislation relating to the construction of wells were continued in 1965. A number of proposed changes to the legislation were discussed and were to be reviewed further.

Convictions were obtained against a water-well contractor for installing well casing of insufficient length to prevent the contamination of ground water, for unlawfully failing to seal the upper open end of the well casing in a manner sufficient to prevent contamination of the well, and for installing well casing of other than new material.

Convictions were also obtained against two water-well contractors for carrying on the business of drilling wells for water without being the holders of licences therefor from the Commission.

Information was laid against a water-well contractor for failing to seal off salty water encountered in his drilling that might impair the quality of potable ground water. The Commission authorized the laying of charges

against another contractor for installing casing of other than new material; the information had not been laid by the end of the year.

Briefs were prepared, for submission to the Commission in 1966, requesting authorization for the prosecutions of a boring contractor and a drilling contractor for constructing water wells without being the holders of licences therefor from the Commission.

Investigations Concerning Well Regulations

Nineteen investigations concerning well regulations were carried out during the year. A number of the investigations required more than one field inspection.

The number of investigations carried out in the various municipalities is indicated below; the figures in brackets indicate the number of investigations in municipalities where more than one problem occurred:

Townships of Albion, Bayham, Burleigh, Cumberland, Edwardsburg, Georgina, Gwillimbury East (2), Gwillimbury North, Landsdowne, Markham, Melville, Middleton, Moulton, Richmond, Tay, Vaughan;

Towns of Gananoque and Smith's Falls.

The investigations and subsequent action taken by the inspectors proved very successful in achieving adequate water supplies in a large number of cases.

HYDROLOGIC DATA BRANCH

The Hydrologic Data Branch was organized to collect basic hydrologic and hydrogeologic data with particular reference to ground and surface waters, and to assemble, analyse and publish the data for Commission and public use. From time to time, emphasis was placed on basic data for specific needs of the Commission. Parts of the Commission's participation under the International Hydrologic Decade were carried out by the Branch - specifically, the assembly of basic material for a ground-water atlas and assessments of ground-water and surface-water resources.

Observation Wells

At the end of the year there were 97 observation wells from which water levels were received and plotted on a regular basis. All observers operated on a voluntary basis and rendered

DIVISION OF WATER RESOURCES HYDROLOGIC DATA BRANCH

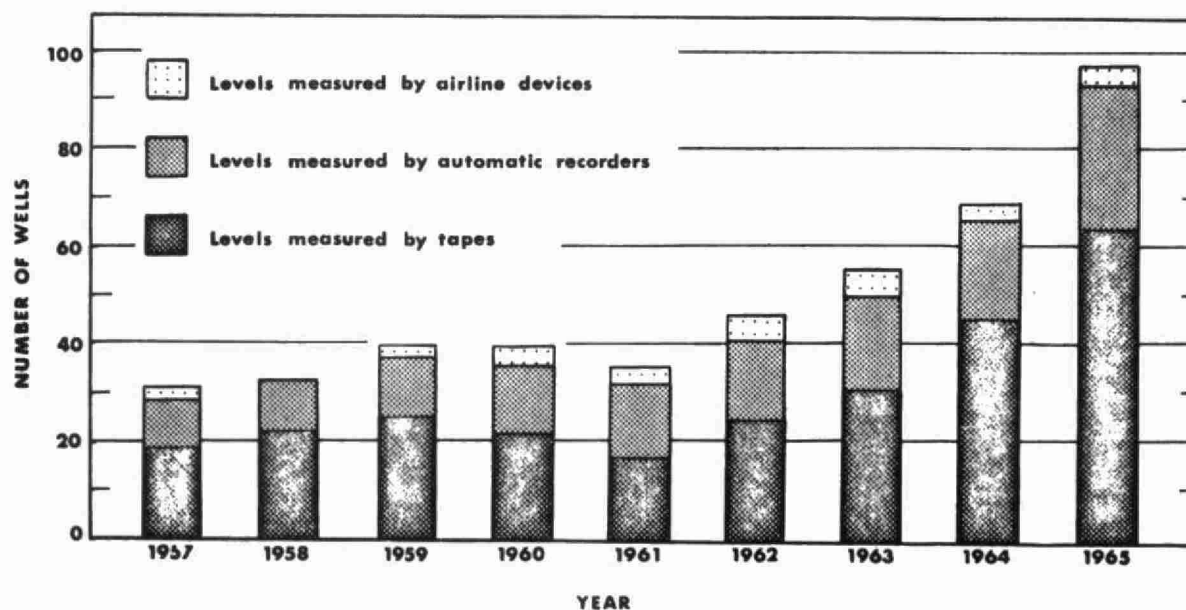


FIGURE 5 OBSERVATION WELLS IN OPERATION

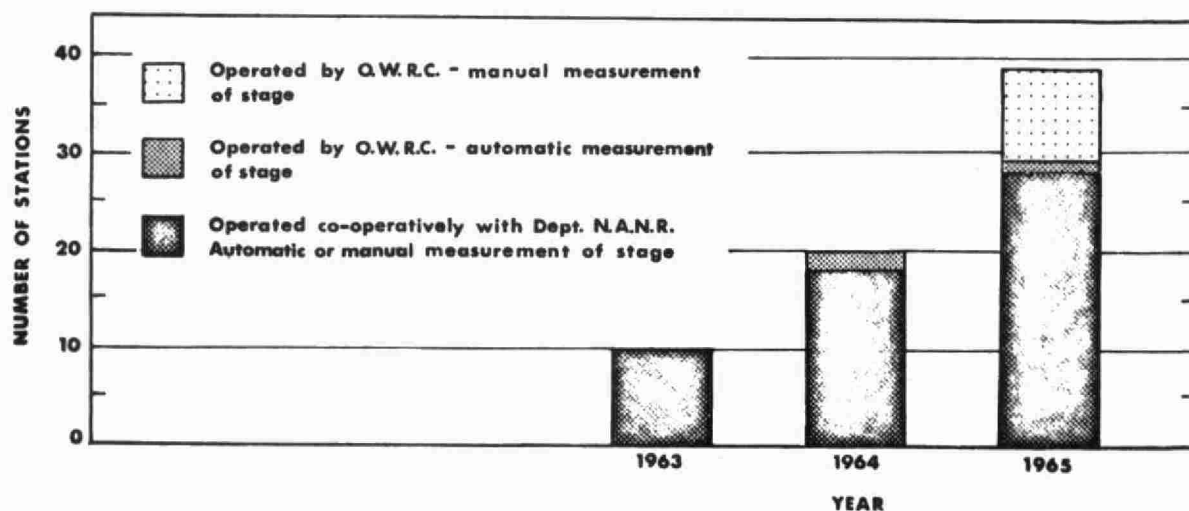


FIGURE 6 STREAMFLOW GAUGING STATIONS IN OPERATION

valuable public service. Figure 5 shows the number of observation wells in operation annually since 1957.

Thirty-nine new observation wells were established; eight were equipped with automatic recorders while the remaining 31 were measured by steel tapes. Two of the new wells replaced wells lost as a result of heavy construction, and were constructed near the original sites under Commission supervision. Fourteen of the new wells are connected with the programs of other branches.

Hydrogeologic Data

Water-well records submitted by licensed boring and drilling contractors in accordance with The Ontario Water Resources Commission Act are filed by the Branch for use by the public and staff. A total of 8,391 water-well records were received during the year. Hydrogeologic data from the well records and from the observation wells are disseminated in the form of ground water bulletins. During 1965, "Ground Water Bulletin No. 3, Ground Water in Ontario, 1957", was published. Printing of Ground Water Bulletin No. 4 for the year 1958 was in progress at the end of the year.

Streamflow Gauging

At the end of the year, there was a total of 38 permanent streamflow gauging stations maintained by the Branch. Twenty-five are fitted with automatic recorders and the remaining thirteen are manual. Twenty-seven of these stations were installed and maintained by the Department of Northern Affairs and National Resources under a co-operative program. Ten automatic recording stations were installed under this co-operative program during the year.

Of the two automatic recording stations established in 1964, the one at Harley was abandoned due to an unsatisfactory control section. Maintenance of the other station at Harley was continued.

Figure 6 shows the number of permanent stream-flow stations in operation since 1963.

A member of the staff took part in the installation of two stream-flow gauges in Northern Ontario river basins.

Synoptic Survey

The Synoptic Survey, which was commenced in 1964, was continued except in the South Nation River area. Eight areas, each containing several drainage basins, were studied. The purpose of the survey was to establish hydrologic and hydrogeologic relations for representative basins in southern Ontario in order to be able to assess better the water resources potential of the areas from limited data, and to design better hydrometric networks.

The field notes and measurements for the 1964 year were being analysed and the preliminary report for the first year's work was under preparation at the end of the year. Maps for all areas showing the surface geology, streamflow stations and observation wells were completed.

The number of streamflow measuring stations, observation wells, and measurements taken during 1965 is shown below. One hundred and nine wells were sampled for chemical analysis.

Area	Drainage Basin	Streamflow Stations		Observation Wells	
		No. of Stations	No. of Measurements	No. of Wells	No. of Measurements
Bear Creek	Bear Creek	24	38	5	45
	Brown Creek	7	0	2	21
	Black Creek	10	0	1	9
	Hardy Creek	5	0	0	0
Big Otter Creek	Big Otter Creek	34	98	8	137
	Little Otter Cr.	7	28	2	40
	South Otter Creek	7	25	2	17
	Catfish Creek	21	49	7	116
Lynn River	Lynn River	16	54	4	46
	Nanticoke Creek	14	36	6	87
	Young Creek	7	28	2	24
	Small Creek	1	1	0	0
	Black Creek	10	4	3	46
Twenty Mile Creek	Forty Mile Creek	5	9	1	10
	Welland River	12	10	5	40
	Twenty Mile Cr.	15	24	8	71

Area	Drainage Basin	Streamflow	Stations	Observation Wells	
		No. of Stations	No. of Measure-ments	No. of Wells	No. of Measure-ments
Bronte Creek	Bronte Creek	38	123	7	60
	Oakville Creek	30	83	7	60
	Grindstone Creek	7	27	4	37
Holland River	Black River	17	67	7	79
	Schomberg River	12	39	6	80
	Holland River	23	83	6	60
Coldwater River	Sturgeon River	7	26	3	41
	Coldwater River	16	71	4	39
	North River	11	40	4	55
Ganaraska River	Ganaraska River	33	127	6	71
	Cobourg Brook	14	55	3	28
	Graham Creek	8	29	1	10
	Gage Creek	4	16	2	20
		405	1,190	116	1,349

International Hydrologic Decade

Work in the ground-water assessment project consisted of planning for the construction of observation wells and the performance of pumping tests.

In the assessment of surface water run-off and hydrologic atlas projects, use was made of information available from the other programs.

RIVER BASIN RESEARCH BRANCH

The programs assigned to the River Basin Research Branch include much of the work to be undertaken in the Commission as part of the International Hydrologic Decade and special research studies on water-sheds including the operation of electrical well logging and other geophysical equipment. Support was given to other branches of the Division by the operation of geophysical equipment. A considerable amount of time was taken in planning and organizing the approach to be used for the new programs.

Representative Basin Studies

Five drainage basins representative of major geomorphologic regions in southern Ontario were selected and the study of the hydrologic conditions in each commenced. Field and office studies were undertaken in each in preparation for hydrometric station installations.

Twelve automatic streamflow gauging stations were installed in the basins. Of these, five were installed in co-operation with the Water Resources Branch of the Department of Northern Affairs and National Resources. Two hundred and twenty-six spot flow measurements were taken at 67 stations. Seven observation wells were installed in one basin.

Blue Springs Creek

Studies in the Blue Springs Creek basin which is representative of kame, till and outwash conditions in southern Ontario are being carried out in co-operation with the University of Guelph.

One automatic streamflow gauging station was installed in the basin in co-operation with the Department of Northern Affairs and National Resources.

The locations of seven proposed observation wells were selected and contract documents were prepared for the installation of the wells.

Three complete streamflow surveys were undertaken at seven metering stations and one survey was made at four staff gauge stations.

Bowmanville, Soper and Wilmot Creeks

The Bowmanville, Soper and Wilmot creeks drainage basins were selected for study as being representative of interlobate moraine, till and clay conditions in southern Ontario. Nine automatic streamflow gauging stations were installed in the basin. Three complete streamflow metering surveys were undertaken at 44 metering stations and, in addition, two surveys were made at the permanent staff gauge locations.

Seventeen sites were selected for the proposed installation of 27 observation wells. A contract was executed for the installation of the observation wells

in the basin. Proposed observers were contacted with respect to the collecting of meteorological data.

East and Middle Oakville Creeks

Field studies were undertaken to determine the effect of ground-water diversion and proposed conservation authority dams on streamflows in the basin. As a result of these studies, it was concluded that the basin would be suitable for study as representative of clay and clay-till conditions in the Province. Proposed sites for four streamflow gauging stations and seven observation-well installations were selected.

Venison Creek

The Venison Creek drainage basin was selected as being representative of sand plain conditions in southern Ontario. Three staff gauges were installed in the basin. Three complete streamflow surveys were carried out at eight metering stations and three surveys were made at the three staff gauge stations.

Seven observation wells were installed at four sites in the basin and one of the wells was equipped with an automatic water-level recorder.

Wilton Creek

The Wilton Creek drainage basin was selected as being representative of limestone plain conditions in southern Ontario. One automatic streamflow gauging station with a concrete control was installed. Three complete streamflow metering surveys were undertaken at eight metering stations.

Experimental Basin Studies

The purpose of experimental basin studies is to determine the natural hydrologic balance of small drainage basins and the effect of changes in land use on this balance. Three basins were proposed and field and office studies were undertaken in two of them in order to obtain a preliminary assessment of their suitability for experimental basin or other special research studies.

Stayner Basin

The Stayner Basin was considered for study because of the extensive changes in vegetal cover that have taken place as a result of the reforestation with conifers of a sizeable section of the basin.

Field investigations were undertaken to determine property limits and elevations of control weir in the basin.

One automatic streamflow gauging station was installed on a tributary of the main creek to obtain data on runoff from the southern portion of the drainage basin.

Alder Creek Basin

The Alder Creek basin was considered for study because of the extensive development of ground-water supplies that has taken place from underlying aquifers.

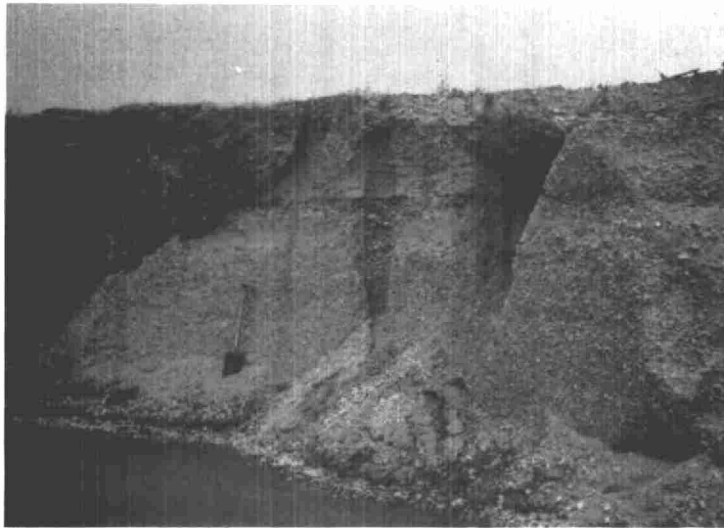
One streamflow gauging station site was selected and equipped with an automatic recorder.

Wilmot Creek

A portion of Wilmot Creek may be considered as an experimental basin. A definite decision on the use of this drainage basin for study is to be made following a review of the data obtained during representative basin studies.

Geophysical Investigations

The electric well logger was operated in one of the observation wells in the Venison Creek basin and in two observation wells installed by the Surveys and Projects Branch in the Big Creek basin.



Gravel deposits are good
sources of ground water.

Clay deposits are poor
sources of ground water.



A water well exposed by
erosion.

Construction of Automatic Streamflow Gauging Station.

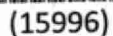


Excavation of trench for stilling well and intake pipes to creek.

Lifting 30" diameter well into trench with the aid of a backhoe.



Plywood shelter and automatic water-level recording unit installed on top of stilling well.



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